

FRENCH MINISTRY OF AGRICULTURE,
COMMERCE, AND PUBLIC WORKS.

COMMISSION

OR

TECHNICAL INSTRUCTION,

APPOINTED BY

Imperial Decree, 22nd June 1863.

ABSTRACT OF EVIDENCE TAKEN BEFORE THE
COMMISSION.

Presented to both Houses of Parliament by Command of Her Majesty.



LONDON:

PRINTED BY GEORGE E. EYRE AND WILLIAM SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY,
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P R E F A C E.

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A second Sub-commission had also been appointed to examine into the state of technical education in England, but as its report is foreign to the object of the present volume (which is rather to give information of what is being done on the Continent), the very short Report of this Sub-commission has not been translated. It should be noticed also that the Report on Germany is very extended, and contains detailed notices of the condition of primary education, with minute descriptions of the schools, and in the translation which will be found in the last volume it has been considerably condensed. The programmes and accounts of the French schools are also given with some diffuseness, and it has been thought advisable to publish only an abstract of them.

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TECHNICAL INSTRUCTION.

ABSTRACT OF EVIDENCE TAKEN BY THE IMPERIAL COMMISSION.

Evidence of M. Monjean, Director of the Chaptal Municipal College at Paris.

THE object of the education given at the Chaptal College is to prepare the pupils for commercial, industrial, agricultural, or artistic pursuits. The school course extends over six years, of which the first four are devoted to instruction of a purely special or professional character, for pupils who cannot afford to give up a longer time to school-work. The course of study of the other two years is of a higher character, and is followed only by students who are to occupy higher positions in commerce, industry, or agriculture, or who aspire to the diploma of Bachelor of Science, or who desire to enter the Central School Arts and Manufactures (*École Centrale des Arts et Manufactures*), the Polytechnic School (*École Polytechnique*), the Superior Normal School (*École Normale Supérieure*), or the School of Fine Arts (*École des Beaux Arts*). Two-thirds of the pupils, who have passed the first four years' course, enter on the superior one, and the number who do so is annually increasing. There are now 90 students who attend the fifth year course. In 1862, 14 pupils of the college presented themselves for examination at the Central School, and all passed. Three out of five passed for the Polytechnic, and two were made serjeants. Three gained honours in the science division of the Upper Normal School, and an old pupil of the college having passed the Normal School, was first in the examination for the licentiate in mathematical science. Out of twenty candidates from the college fourteen passed the examination for Bachelor of Science.

The study of Latin is compulsory, commencing with the third and terminating with the fifth year of the school course. There are only two classes a week, and the pupils beginning it are about 14 years old. With this small amount of instruction in Latin, however, the pupils are enabled to pass the examination for Bachelor of Science, which as far as

Course of
study at the
Chaptal
Municipal
College.

Study of
Latin.

regards the Latin language, is, with the exception of verse composition, the same as that for Bachelor of Literature (*Bachelier ès Lettres*).

Statistics of
the College.

The number of pupils at the college amounts to 950, of whom 600 are boarders and 350 day pupils, and this number would be increased if there were room: at present many pupils are refused every year.

As at the Lycées pupils are admitted to the college at nine years old. The large demand for admittance is due to the great development which has been given to literary, without losing sight of a more practical education. Both parents and students attach great importance to those courses of study which have no special reference to any particular examination or to any definite pursuit; thus the courses of the history of literature and of political economy are attended by pupils going up to the higher schools, though they do not form part of the list of subjects required in them.

There is no special instruction for apprenticeship (*enseignement spécial d'apprentissage*), for which, in M. Monjean's opinion, with the exception of agricultural schools, the workshop is the best school.

Financial
position.

The financial receipts of the college amounted in 1863 to 780,000 francs, giving an average of 821 francs per pupil. Thirty half-scholarships (*demi-bourses*) for boarders, and thirty scholarships for day pupils, have been established by the city of Paris. Each boarder pays the sum of 1,050, 1,100 or 1,200 francs, according as he belongs to the lower, middle, or upper college, and each day pupil 250 francs for the lower course and 350 for the upper. The Chaptal College was founded in 1844 by the city of Paris, but the building then erected serves now only for the middle college; the private resources of the establishment have sufficed, though with difficulty, for extending it to its present dimensions. In 10 years 1,000,000 francs have been expended in building and in buying land, and at present the college is free from debt, and the receipts exceed the expenditure by a sum of 70,000 francs.

Opinion of
M. Monjean
on the con-
dition of
technical
education in
France.

In giving his general views on the subject of special or professional education in France, M. Monjean states that the country possesses more of the elements of its further development than is generally supposed. Already twenty-five years ago, the city of Paris founded the professional schools of Chaptal and of Turgot. The object in founding the former was to give to the children of the middle classes a training for commercial and industrial pursuits which a classical education could not afford, and in founding the

latter to give to the children of the lower middle classes an education superior to that of the primary schools, and one fitted to give increased value to their intellectual and manual labours. At the same time it must be understood that the instruction at these institutions is of a general and not of an exclusively practical character, and by this means M. Monjean is of opinion that the city of Paris is in advance of the educationists of Germany.

M. Monjean's observations on the results of the Practical Schools (*Real Schulen*) in Germany, have led him to the conclusion that the prevalence of an instruction purely practical, and based entirely on the applied sciences, has directed the attention of young men exclusively to subjects of self-interest and immediate profit, and has quenched the generous aspiration which sees in life something else than mere profit to be realized; the moral in fact is sacrificed to the mechanical man. Moreover, though the German practical schools have produced such moral results, they have not obtained for industry and commerce the objects they had in view. On this point practical experience has given decisive evidence. Some merchants of Cologne and of Magdeburg having selected from the practical schools and the gymnasias a certain number of young men of equal intelligence and capabilities, placed them at the same kind of work; for a short time the pupils who had been brought up at the former schools maintained a certain degree of superiority, but when they had been submitted to a longer period of probation it was found that they were beaten by the pupils of the gymnasias, who having received a more general and intelligent education, were better adapted for all pursuits to which they might be called. Besides, crude ideas of socialism have developed themselves among the young men brought up at these practical schools, a political danger which M. Monjean considers the Government and the Commission will not fail to appreciate. A further proof of the correctness of M. Monjean's opinions on this point, is that as he states the Governments both of Prussia and of Austria have determined to retrace their steps, and under the name of Practical Gymnasium (*Real-gymnasium*), to introduce a number of schools which shall give greater importance to general and literary studies.

M. Monjean was requested to give a description of education in Germany. He states that as regards professional, or rather technical education, Germany has still a great deal to do; there is a considerable hiatus between the primary education and the higher instruction of the universities.

Practical
Schools of
Germany.

Views of
M. Monjean
on what can
be done to
extend and
develop tech-
nical edu-
cation in
France.

Technical
education in
Germany.

All the children in Germany are compelled to go to the primary schools, and those who quit them at the age of 12 years must attend the courses given in the Sunday school. This compulsory system has, however, not been introduced without some difficulty, and, in some states, penal statutes have actually been found necessary; it is also found that working men often lose the desire for self-instruction in consequence of having had to submit to compulsion in their youth; they have not the eagerness for learning which characterizes the French working classes.

Various
Polytechnic
Institutions in
Germany.

The necessity for establishing a system of technical instruction has been widely felt throughout the whole of Germany. The government of Würtemberg is building a polytechnic institution which will cost 1,400,000 francs, where the annual fee for the course of instruction is not to be more than 15 francs. One of the best organized and best attended polytechnic institutions is at Carlsruhe, and there is one of the same sort at Prague. The Polytechnic School at Vienna has fallen from five hundred students to one hundred, and the Austrian Government is now occupied with its re-organization and improvement. In efficiency and perfection of instruction no German school comes near the Central School and the Conservatory of Arts and Trades at Paris. The great defect of the Polytechnic Institutions in Germany, as well as of that at Zürich, is that the pupils are at liberty to follow any course of study they please; some are earnest and industrious, but a great number lead an idle and dissipated life. Another fault is that in the German schools residence is not required. The large French schools have established a clearly defined system of instruction, compulsory on all and leading to a diploma. This forms a stimulus to young men which nothing else can replace, and is one of the causes of superiority of the Central School in Paris over all similar institutions in Germany.

Views of
M. Monjean
on what can
be done to
extend and
develop tech-
nical edu-
cation in
France.

The following are M. Monjean's ideas on the means necessary to extend professional or, as he would prefer to call it, technical education in France. He says:—"Develop
" primary education, which is no longer equal to the wants
" of the country, by introducing into it the elements of
" natural and physical science; establish on a broad basis
" agricultural and trade schools; increase the number of
" teachers for adult instruction, not by the direct interven-
" tion of the State, but by enlightened and systematic
" encouragement; found in all the important commercial
" and industrial centres (and that by inviting the co-operation
" of the municipalities, of public societies, and of private

“ individuals), schools specially adapted to the wants of
 “ each locality.”

With regard to schools established by large industrial Schools in
 manufacturers in connexion with their works, and for the connexion
 benefit of the workpeople and their children, M. Monjean with large
 believes that such institutions produce the greatest good, manufacturing
 not only from an educational point of view, but also as establishments.
 tending to draw closer the bands that unite the employer
 and the employed. To convert, however, these schools,
 which owe their origin to private liberality, into Govern-
 ment establishments, would endanger the good which they
 do, and weaken their moral power.

It is of the greatest importance, both to the Government Evening
 and to society, to give to the artizan an instruction which, classes for
 while elevating his intelligence and increasing his resources, adults.
 will enable him to add considerably to his wages. For such
 a purpose nothing can be better than the lectures given at the
 Conservatory of Arts and Trades, than those held by the Poly-
 technic and Philotechnic Societies, and than the gratuitous
 courses of lessons in drawing. The school founded by the
 chamber of commerce in the Rue Trudaine is another
 example; a fee of three francs per month admits to the
 evening lectures, and more than a hundred and fifty artizans,
 apprentices, or small clerks, have entered their names on
 the register of attendance.

In reply to the question whether such educational insti- Nature of the
 tutions for adults should be undertaken by the State, the governing
 municipalities, or by private individuals, M. Monjean re- body under
 plied that in his opinion such establishments owe their whom courses
 authority with the public chiefly to their municipal charac- of lectures for
 ter. The municipalities are better patrons than the State, adults should
 because they permit persons in whom they place confidence be placed.
 to take the initiative; if any fault is discovered the remedy
 is rapidly applied, and there is no reason to fear that endless
 administrative dilatoriness, which paralyses everything,
 because it pretends to regulate everything.

It is to be regretted that so many private efforts in the
 same direction have not met with the success which they
 deserve, and it should perhaps be an object to the Govern-
 ment to second such efforts, not by a direct patronage,
 which would be a clog, but by every facility which it could
 put in their way. It is greatly to be doubted whether the
 College Chaptal could have attained its present success if it
 had been founded by merely private action; the question
 whether it could now maintain its position if left to its own
 resources is one which need not be considered.

*Evidence of M. Marguerin, Director of the Turgot
Municipal School, Paris.*

Social position
of the children
who attend the
Turgot School.

The system of education at the Turgot School is more immediately adapted to the lower middle class: the parents of the children who frequent it are either workpeople who carry on small manufactures at their own houses, small retail tradesmen, inferior employés in large public and private companies (as for example the railway companies), foremen, chiefs of workshops, and the more skilled artizans. Parents also in a higher commercial and industrial position send their children to the school, preferring the more general and practical education which it affords to that which can be obtained at the Lycées: on the other hand through the scholarships maintained by the city of Paris, the school has a number of children whose families belong more strictly speaking to the artizan class. These two groups form about two-sevenths of the whole number of scholars, of whom there are in all 740.

Scholarships.

There are 94 scholarships maintained by the liberality of the city of Paris at the Turgot School. Every year a general competitive examination among the pupils of the lay and ecclesiastical communal schools takes place at the Hôtel de Ville. The school is thus able to raise a considerable number of pupils belonging originally to the artizan class to a higher social position, and to enable them after attending the Schools of Arts and Trades and even the Central School to become accountants and superior clerks.

Character of
the instruc-
tion.

The regular course of the school occupies three years, preceded by a preparatory and succeeded by a supplementary year. The preparatory year is not compulsory, but the greater part of the pupils go through it, finding themselves not sufficiently advanced for the examination for admission to the first year of the regular course. The supplementary or fifth year's course is not attended by a great number of pupils, not more in fact than 20 at present. This course is intended for the children of parents in more easy circumstances and for those pupils who possess more remarkable capabilities. In the complementary year special objects are pursued; the young men who attend the course, and who are there from 16 to 18 years old, pass, some into the Central School, some into the School of Fine Arts; many prepare for the examination of surveyor of bridges and roads (*Conducteurs des Ponts et Chaussées*), others again return to their parents, whose business they are to follow, such as joiners, carpenters, locksmiths, surveyors, small contractors,

and manufacturers. It is important that pupils like these should have a knowledge of descriptive geometry with its application to stonework and carpentry, and also of architectural and machine drawing, and that they should be practised in the manipulation of the school laboratory; the theory which has been studied will aid and improve practice and shorten the time of apprenticeship.

Children can scarcely enter the Turgot School before the age of 12 years, the greater number of them having been obliged to pass through the preparatory year; but often children of 13, 14, or even 15 years present themselves for admission, and then with so little acquired knowledge, so few habits of industry, and an intellect so badly trained that it is impossible to admit them directly to the first year of the regular course. Primary instruction, whether private or communal, and especially the private, is far from giving the results expected of it. The Turgot School and other schools of the same description ought to have elementary classes where the primary instruction given by numerous and well trained teachers would really be completed at the age of 12 years. As it is, many of the pupils having arrived at an age to enter business are compelled to leave the school before their studies are finished. In the question of purely technical schools this consideration is one of the highest importance. If a boy has finished his primary education at 12 years old he can receive a good secondary instruction between the ages of 12 and 15, and then it is not too late for him to enter upon an industrial apprenticeship, whether it be in a special mechanical or weaving school (*école de tissage*), or in a laboratory or in a workshop, and he will have been so well prepared for this special apprenticeship that the customary time will certainly be diminished. If a pupil leaves the secondary school at too great an age he tries at once to get a situation in an office; it is well known what obstacles and discouragements he will meet with in this course.

The fee at the Turgot School is 15 francs per month, in which is included all school necessities except books; and this fee, though comparatively a high one, has not hindered the success of the school. It should be noticed that there are already more than 200 children at the school beyond its capabilities, the building having been originally intended for 500 pupils only. Notwithstanding this, however, it is impossible to admit all the children that present themselves. Thus in October 1863, 100 pupils were rejected for want of space, and of these more than 80 have renewed their appli-

Age of admission to the Turgot School.

Number of pupils at the school.

Destination of
the pupils.

cation for admission in January 1864, although they are aware that there are scarcely ten vacancies. In two years' time the school could easily number 1,200 pupils, supposing there were space for them, especially if the number of divisions in the upper school were increased and if elementary classes were established. To the pupils of the Turgot School nearly all professions are open which do not absolutely require classical studies at the Lycées. Commerce and manufactures naturally draw the greater number of pupils, commission and banking businesses also receive several, the rest distribute themselves among the industrial arts, the building trades, the bridges and roads (*Ponts et Chaussées*), and railway companies. Only a few enter the Schools of Arts and Trades because it is not intended that the Turgot should be a special preparation for these schools. Much information on the destination of the pupils of the school can be obtained from the year book of the Friendly Society of the old pupils of the Turgot School (*L'annuaire de l'Association Amicale des anciens Elèves de l'Ecole Turgot*). Every year about 150 pupils leave the school and easily obtain situations. In the month of August, at the end of the scholastic year, demands for employés from the heads of commercial and industrial establishments are most frequently made, and in this way in 1863 more than 100 pupils found situations within a period of two months; the others were provided for by their families or remained at home to work in their fathers' business.

Course of
study.

Mathematical
and natural
science.

The instruction at the Turgot School is divided into three courses of study; the first comprises mathematical and physical science, the second the graphic arts (*les arts graphiques*), the third, religious instruction, history and geography, and the French, English, and German languages with their respective literatures. Under mathematics are comprised arithmetic, plain and solid geometry, algebra to the binomial theorem, plain trigonometry, the elements of analytical geometry and descriptive geometry. The course of elementary physics and mechanics commenced in the second and third year is completed in the fourth. Chemistry which is learned for three years comprises both inorganic and organic chemistry as well as the elements of analysis. Under natural history is included physiology, zoology, botany, mineralogy, and geology, with their principal applications to the industrial arts.

Graphic art.

In the course of graphic art are comprised artistic and geometrical drawing. Artistic drawing is restricted to ornament, time being wanting for the drawing of the figure. The

students draw from lithographed copies, as well as from the cast; some are instructed in modelling. Geometrical drawing extends from the tracing of curves to the drawing of buildings and machines, theoretical as well as practical, so that the pupil who has attended the course, has a good knowledge of projections and the penetration of solids. In the graphic arts is also included caligraphy, which is of great importance in a school; the pupils are practised in different kinds of writing until they leave school.

The studies of the third group constitute what may be called the humanities. Religious teaching is both historical and dogmatic. The historical instruction passes rapidly in review ancient history, and enters with more detail into the history of the middle ages and of modern times, special attention being paid to the history of France, and those economic facts on which it is so important that students should have correct and precise ideas. The course of literature, which comprehends style, composition, and the great epochs of the history of literature, is founded upon the principles of logic and moral truth. As the course of study includes neither Greek nor Latin it has been found necessary to invent other methods of instruction to enable the pupils to obtain a correct knowledge of the French language.

Language and literature.

Besides these three groups of studies there is the study of accounts which is a specialty in the school and amounts almost to a practical apprenticeship. It is distributed over the three years of the regular course, and comprises the elements of commercial arithmetic, and the keeping of books and accounts, with the theory of exchanges and arbitrations.

Accounts.

It is an object to make the education of the school as general as possible, it is therefore at the same time both theoretical and practical: theoretical without being speculative, for the studies have to be applied; and practical, for by that it is distinguished from the education of the Lycées. All the courses of the school are compulsory on all the students; it is found impossible to divide them into groups destined for special professions. It is impossible to dictate to a child of 12 years without knowing his capabilities, the amount of his intelligence, or his habits of industry what should be the profession he should adopt, without exposing him to numberless mistakes and disappointments. But when a youth has received an education of a more general character it is comparatively easy for him to adapt himself to any circumstances in which he may be placed.

General character of the education.

M. Marguerin is not of the same opinion with M. Monjean as to the direction under which such schools

Nature of the direction under

which such schools should be placed.

should be placed. He believes that schools like the Turgot School, meeting the requirements of the middle-classes, would have a like amount of success, whether under the direction of the municipalities, the chambers of commerce, or the industrial societies, or whether they had been founded by private individual enterprise; but always on condition that they might have full liberty of action to choose their own masters, to extend or limit their courses of study, and to adapt themselves to the wants of the industries of the localities in which they are placed.

Financial statement of the Turgot School.

The Turgot School is self-supporting, both the receipts and the expenditure amounting to 113,000 francs, but there is no charge for rent nor for building repairs. For a long time the school was a charge to the city of Paris, and now the number of pupils is considerably in excess of the room at its disposal. Should that be decreased to the normal maximum by the division of classes and by the establishment (as is intended) of other Turgot schools, which will be sure to take many of the pupils who now come from the distant parts of Paris, it is not probable that the receipts would cover the expenditure under the present organization of the school.

Pecuniary aid more necessary in metropolitan than in provincial schools.

M. Marguerin considers that if a school of this description requires external assistance when established in Paris it is not so likely to need pecuniary aid when founded in the provinces. With 740 pupils, as at the Turgot School, the relations of the school with the parents of the children, with commerce and industry, with former pupils, with the governing body, will require a costly and numerous staff, which cannot participate in the instruction of the school. With 300 pupils this staff may be less, and its members can take part in the active instruction. A less sum would also suffice for the annual expenses in the purchase of tools, mechanical instruments, and collections of physical apparatus. On the whole M. Marguerin concludes that a provincial school which could, considering the less number of its scholars, adopt a different organisation to that of the Turgot School, besides reducing its educational staff, where the parents would provide scholastic necessities, or where the school fee might be higher than it is in Paris, would not only be self-supporting but might even yield a revenue. The necessity for school buildings and for the payment of rent is another reason for making it desirable for technical schools to have the assistance of the different towns, chambers of commerce, and industrial societies.

Manual labour in industrial schools.

M. Marguerin is not of opinion that the introduction of manual labour into technical schools would be productive of

any practical benefit. He considers that one of the great advantages of the system of education established at the Turgot and other schools of the same description is that the pupil has completed all his more important studies before he is too old to enter upon his apprenticeship. In order that the pupil might undergo a course of manual labour at school he would be compelled to sacrifice some of the more important branches of general education, which the teacher finds to be so useful in the training of his pupils. It is a common argument to refer to the professional school at Mulhouse, but it must be borne in mind that the manual labour in that school is confined to two hours of joiner's work in the week, and that this labour is considered more as an athletic exercise than as a preparation for apprenticeship; also, that the mechanical workshop, the chemical laboratory, the school of design, and the weaving workshop, which form a part of the Mulhouse School, only take in pupils after they have received several years of general instruction. It would in every way be better that such workshops should be distinct and independent, and should be formed into special forms of apprenticeship, open equally to the son of the workman and of the manufacturer.

M. Marguerin having heard the industrial schools of England much spoken of, where the pupils learnt a little theory in the class-room, and much practice in the workshop, visited that country for the purpose of forming his own opinion upon the subject. He found that the idea of the English schools entertained in France is a wrong one. It has been the habit there to regard as industrial schools the Ragged and Reformatory schools, which are, in fact, rather houses of correction, where are confined the children of the lowest class of the population, already branded by vice or condemned for theft; criminals, in fact, whom it is attempted to wean from a life of misery and degradation. These schools have been founded for the dangerous and not for the working classes of English society. It is their object to inculcate some notions of religion and virtue into children prematurely vicious. Their inmates are taught the elements of primary instruction, and some trade that may enable them, when they are reformed, to gain their own livelihood. Thus, at the Norwood School the boys have the care of all the repairs of the house, the carpenter's, the locksmith's, and the painter's work. They make the clothes and the shoes; they tend the cattle and cultivate the kitchen garden. The girls do the washing, mend the linen, and occupy themselves in the kitchen and

Industrial
schools
England

Schools in
connexion
with the large
manufactories
in England.

Secular
schools.

Condition of
the educational
question in
England.

Middle-class
schools.

household. They leave the schools to enter into service, while the boys become workmen and labourers. It is not that in England no attention is paid to the great question of instruction adapted for the middle and the working classes; but it is not attempted to bring the workshop into the school, on the contrary it is the school which is attached to the workshop. Everywhere in large manufactories classes are founded, maintained, and watched over by the employer himself. In towns the schools best adapted to the wants of the middle class are those called secular schools, because they abstain from all religious dogmatism, and are content to give a general education. These institutions have great analogy with the Turgot School. The force of circumstances in the two countries has led nearly to the same devices to satisfy the same wants. The great obstacle to the development of secular schools in England is that sectarian spirit which will not permit an educational establishment to leave the care of religious instruction to the parents, and to hold itself aloof from every denomination. As regards manual labour associated with instruction or apprenticeship brought into the school, it is an idea quite contrary to English notions, and one which they regard almost as a chimera.

England has long been occupied with the great question of middle and working class education; the development of instruction and its application to the wants of agriculture, commerce, and manufactures could not be neglected in so liberal and practical a country. Everywhere in England classical instruction is made to give way to what is called modern education. This modern education consists in the study of the physical and mathematical sciences, history, and political economy. One of the most important results of this movement is the foundation of the University of London, which represents more especially the scientific wants of the age and which was established as a rival, so to speak, of the old Universities of Oxford and Cambridge—the representatives in its purity of the old fashioned classical education. The same spirit which gave rise to the University of London has determined the foundation of great establishments for secondary instruction, whose system should meet the requirements of the examinations and the diploma of the new university. Thus in London itself King's College and the City of London School, as well as the old foundations of the city corporations, the Merchant Taylor's and the Brewers, may be cited as examples. In all these institutions by the side of the classical divisions where Latin and Greek form the basis of education, a modern

division has been established in which the mathematical and physical sciences and modern languages take the lead of or even replace Latin. These modern divisions have a great analogy with the scientific divisions established in the French Lycées and Colleges, or with the divisions of special instruction, commonly so called, which have hitherto languished and which it is now proposed to re-organize under the new and little appropriate name of *professional instruction*.

These English schools are rather intended for the richer portion of the middle class; below them come the institutions which are called Grammar Schools. The numerous grammar schools were mostly founded during the reigns of Elizabeth and Edward VI., that is to say, the period of the reformation. They have had different fortunes, some of them, as Harrow, Eton, and Rugby, have made for themselves European reputations, and having attracted principally the upper classes of society have assumed almost an aristocratic character. At these schools classical instruction remains in full force; but a great number of the other grammar schools, frequented by students of the middle class, are already in course of transformation, by superseding the study of Latin and Greek by a more modern instruction. They cannot, however, completely do so, because they are bound by their ancient charters of foundation. Some of them, not to be false to their charters, continue to give instruction in Latin to perhaps 20 or 25 pupils, the remaining two or three hundred receive modern instruction in the sciences and the living languages.

By the side of the grammar schools there exist two other kinds of institutions—*private schools* (in great number and of every degree) and *proprietary schools*. These latter are founded by a sort of joint-stock company and are administered by the shareholders themselves, not as a profitable speculation, but with the object of securing for their children an education suitable to their position in life. Of course proprietary schools do not give a purely classical education; they maintain also an instruction adapted to the wants of manufacture and commerce. It is the same in a still higher degree in the mass of private schools which exist in England. For a long time the absolute freedom of education has produced a number of private establishments, so bad in every respect that private schools no longer enjoyed a good reputation with the public. Some years ago several of the principals of private schools formed themselves into a society, which they call the College of Preceptors, with the

object of securing for their profession public consideration; they have obtained a charter, by virtue of which the principal of every establishment who enters the union, for the purpose of obtaining the benefit of a moral guarantee with the public, is required to pass an examination and to submit himself to certain obligations. Thus in all the institutions which have been mentioned modern education is more or less replacing the long established classical education, notwithstanding that custom and tradition have gained for the study of the ancient languages a greater prestige in England even than in France.

Secular
schools.

The *Secular Schools* owe their foundation to the same spirit which has given rise to what is called the Manchester school of politics; they are called secular schools because they secularize instruction so to speak more than has hitherto been the case in England, by excluding from it all dogmatic religion—a great innovation in a country where religious questions have so much influence. Notwithstanding that these schools had at the very outset to encounter the antagonism both of the Established Church and of the Nonconformist sects, they have succeeded better than a great number of other institutions, because they respond to a national requirement. Already in England there are more than thirty such schools. Of course Latin and Greek are altogether excluded from the course of instruction of the secular schools, and are replaced by the mathematical, physical, and natural sciences, modern languages, history, and political economy. It is not, however, in the subjects of instruction alone that innovation has been made; the secular schools are distinguished no less for the improvement which they have effected in the method of teaching than for the spirit which has placed them above all religious dogmatism.

M. Marguerin considers that instruction in England is inferior to that in France, in that it addresses itself less to the intelligence and to the reasoning powers than to the memory. One of the objects of the secular schools is to break through the traditions and customs of English teaching; their methods of instruction are more free, and more fertile of results. They practise and sharpen the intelligence; they aim at the general development of the intellect by directing it to the practical, and by training it to comprehend the conditions of modern society.

Result of
modern edu-
cation in
England.

This natural tendency of the middle classes to get rid of the classical and to seek for an education better adapted to their wants, has produced a remarkable and not unimportant result. The old universities of Oxford and Cambridge,

those sanctuaries of classical study, have been aroused; they have desired to guard themselves against the rivalry of the more recently established University of London. They have organized what they call middle-class examinations, by which they hope to retain their influence over the young generation. These are a sort of examination for a degree: the subjects are numerous, but the candidate chooses what he will take up.

The movement in favour of popular education, that is to say, primary education, in England dates from the year 1825, and the progress which it has made is due principally to the exertions of private associations. The two most important of these are the British and Foreign and the National Societies, then come the Home and Colonial Society, the Wesleyan Schools Society, the Poor Catholic Schools Committee, the Ragged Schools Union, etc. The action of these societies has consisted in organizing everywhere primary instruction, in arousing public opinion, in aiding in the erection of school buildings, in training masters, and in publishing books; they aim, however, only at general and primary instruction, not at technical or special. But the public requirements were so great that the efforts of the societies alone were unable to meet them, and the State was compelled to come to their relief. A sub-committee of the Privy Council was formed, to which the care of national education was entrusted; it is called the Committee of Council on Education. The committee negotiates directly with the societies, and makes grants, subject to certain conditions in the erection and management of the schools, and to the obligation of their receiving the visits of the inspectors. Thus the Government says to the societies, "I will give you money, but I will inspect your schools; I will verify your results, and I will withdraw or increase the grants according as those results are satisfactory or not." The societies then do not found schools themselves, they place themselves in connexion with local committees, which are spontaneously formed in the different towns and villages, and they are aided partly by the grants received from Government and by private subscriptions. When the school is founded the society places at the disposition of the local committee a master trained in one of its normal schools; in fact it is by their normal schools that the societies have been able to regenerate, improve, and develop primary instruction. The normal schools are often handsome and large edifices, admirably arranged; they generally have in connexion with them practising and model schools.

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Mechanics
Institutes

Tendency of
primary to
develop into
secondary
education.

Thus the societies have constituted a vast system of primary instruction, which is the first step towards popular education; afterwards, by the force of the same circumstances, the primary schools have entered upon the domain of professional, or rather, to speak more correctly, industrial education; they have a tendency to overstep, they have, in some instances overstepped the limits of primary instruction, and have arrived at what in France is called superior primary education. The English understand that this is in reality an industrial education, general it is true, and not technical but nevertheless very practical and particularly useful. If the child of a working man, in addition to the elements of primary education, receives instruction in the higher branches of arithmetic, plain, and a little solid geometry, free hand and geometrical drawing, and the physical and natural sciences, if he enters the primary school at the age of six or seven years and leaves it at 14 or 15, he is perfectly prepared to go into a workshop or into a manufactory, and is ready to become an excellent workman. Thus primary instruction prolonged and crowned, so to speak, by superior instruction, may be called really industrial.

Mechanics'
Institutes.

Dr. Birkbeck was the first to establish courses of evening lectures for adults, and his first attempts having been received with great favour he passed his life in developing this idea. On this plan there were established everywhere in England Mechanics' Institutes, where it was proposed to organize, on a large scale, scientific education for artizans. These Mechanics' Institutes succeeded very well in Scotland, because there primary instruction is much more disseminated than in England, and the workpeople in consequence were better able to follow and profit by the courses of lectures. In England, on the contrary, where primary education was less developed, the Mechanics' Institutes, after the first success began to decline. They were not altogether closed but they were turned rather into places of amusement than of instruction. More lately, however, now that primary education has been extended by the influence of the school societies the Mechanics' Institutes are again returning to their first destination, and, now-a-days, courses of lectures in theoretical and applied science are given and well attended, lectures intended not to please and amuse but to instruct. Some of these establishments, which have even become the property of artizans themselves, like the one at Manchester, are very large, and contain well-furnished libraries, lecture halls, and class-rooms.

The Government, notwithstanding its habit of holding aloof, could not longer remain indifferent to the force of this movement; it was compelled to interpose, as it had interposed in primary instruction, and to do for the work-people themselves what it had already done for their children. This step was taken when the first Exhibition at London had established the superiority of the art manufactures of France. The English were compelled to acknowledge the necessity of forming the taste of the work-people, the manufacturers, and even of the public; and it was then that they established the magnificent institution at South Kensington, and the system of which it is the centre.

In forming this veritable metropolis of art education, the English seem to have adopted the spirit of French centralization; thus, more than a hundred schools of design established in the centres of industry throughout the kingdom depend to a certain extent on Kensington; teachers trained in the normal school at Kensington are sent to the provincial schools, where they adopt the same system of instruction. From the collections of models, lithographs, engravings, casts, and other objects of art in the South Kensington Museum a travelling collection is formed, which is forwarded successively to all the French establishments in the provinces, and, having made the tour of the country, returns to South Kensington.

The system by which the teachers are paid is perhaps a little complicated, but up to this time it appears to produce good results. The idea on which it depends is that the teacher should be paid partly by a sum fixed in amount, partly by a sum contingent on the number of pupils he may have, and the success they may obtain in the examinations. Thus the prizes given to the pupils—and they are numerous—become a source of profit to the teachers; every distinction obtained by the pupil brings, in a proportional degree, a pecuniary reward to the teacher.

But instruction in art-drawing alone does not constitute a complete system of technical instruction; it was soon found necessary to organize also scientific education for the working classes. Since 1859 the department of the Privy Council administering the institutions at South Kensington has adopted the significant title of the "Science and Art Department." Courses in the principal branches of mathematical and physical science were given at South Kensington; they were established also in the chief provincial towns, chiefly in those where schools of art were in existence. The

General character of modern education in England.

same organization was adopted for instruction in science as already existed for instruction in art ; thus artizans cannot only attend regular courses of lectures, but they can also pass examinations and receive diplomas, and these diplomas have a pecuniary value for the science teachers as is the case for the art teachers.

General character of modern education in England.

In summing up, M. Marguerin believes that there is in course of being established in England an extensive system of technical education for artizans, maintained to some extent by the private efforts of the artizans themselves, but largely aided by grants from Government. Both that and the education of the middle classes (which is reforming itself) comprises the mathematical and physical sciences, drawing, and modern languages ; it is general and theoretical, and yet applied ; it addresses itself to the intelligence, not to the hand ; it leaves apprenticeship to the workshop, and does not introduce it into the school.

Views of M. Marguerin on the course to be adopted in developing technical education in France.

In M. Marguerin's opinion the problem of technical education would be in part solved by the establishment, in all parts of France, of Schools organized on the plan of the Turgot school, giving a general and not a special instruction. But in order that these schools may be successful, it is necessary that they should form distinct establishments everywhere, where the necessity for that distinction exists. They must meet the wants of the localities where they are situated, being in one place commercial schools, in another industrial, in a third, agricultural ; and they must be organized so as to attract to themselves the lower middle-classes, and the élite of the working classes. Particular care must be taken that they adapt themselves to the social condition of the population around them. The success of the technical school at Mulhouse, proves how great an advantage it is to be on a separate and distinct footing ; if this school had been but a division of the College at Mulhouse, it would not have developed itself as it has done. Lyons, Marseilles, St. Etienne, Bordeaux, Nantes, Rouen, Amiens, Lille, &c., are sufficiently important centres for Lycées and technical schools to prosper side by side, and the more so when the two establishments are kept separate and distinct from one another.

Extension of technical instruction to the upper, primary, and communal schools.

M. Marguerin would also recommend that the same kind of instruction should be introduced into such of the upper primary schools (*écoles primaires supérieures*) as are still in existence, and into those communal colleges where classical studies are not so strongly insisted on. Thus an extensive system of technical education would be established in the

country on a most comprehensive plan, and at the least possible expense. In this system, professional instruction would maintain all that flexibility which is indispensable to it without ceasing to be general; it could, according to need, be in one place more commercial, in another more industrial, in a third more agricultural. For it would not be confined within the rigid limits of a uniform plan; though under the inspection of a central authority it would preserve the liberty of action which is necessary to the success and prosperity of every institution.

With regard to the Schools of Application (*Ecoles d'application*) where the technical and the special ought to predominate, such as the weaving school (*Ecole de Tissage*) at Mulhouse, the school for the manufacture of clocks and watches (*Ecole d'Horlogerie*), at Besançon; it is very easy to understand their utility. It is an excellent plan to establish such schools in localities where they would meet the wants of great industries demanding them. If the existing schools of Arts and Trades (*Ecoles des Arts et Métiers*), at Châlons, at Angers, and Aix, do not yield every year a sufficient number of workmen and mechanical draughtsmen, new schools of the same description should be established. If the agricultural schools of Grignon, Grand-Jouan, and La Saulsaie, and the farming schools (*Fermes Ecoles*), are not large enough to admit all the applicants, of course it would be necessary to multiply such establishments; the demand proves and necessitates the supply. And still what is being done in the Turgot School, would be done in other establishments of the same description, for they would find in the Schools of Application, a natural outlet for their scholars, and the latter would be recruited from a body of children perfectly prepared for practical apprenticeship.

In summing up what he has to say upon the subject, M. Marguerin repeats his objections to the introduction of manual labour into schools. In the first place, he believes that the expense of providing teachers and tools for instruction in so many branches of trade and manufacture would form a serious consideration; secondly, that the schools are not likely to reap any profit from the sale of the manufactured article, as it can scarcely be supposed that in this they can compete with well trained and skilled artisans; and, lastly, he believes that the dangers and abuses of apprenticeship in the workshop have been exaggerated.

But though he doubts the advantages of the introduction of manual labour into schools, he fully realizes the benefits of attaching schools to the workshop. A communal school,

Schools of Application.

Objections to the introduction of practical handicrafts into technical schools.

Technical schools attached to manufactories.

School at
Creusot
Works.

which is at the same time an industrial one, has been established by the proprietors of the great works at Creusot for the benefit of their workpeople and their children; it numbers now no less than 900 scholars. In the upper classes are taught arithmetic, geometry, the elements of algebra, trigonometry, and mechanics, together with physics, chemistry, and geometrical drawing. At the age of 14 or 15 years the pupils leave the school to be employed in the works, and they are distributed according to their capabilities among the drawing rooms, the fitting shops, and the offices. After they have entered the factory they can also attend the evening classes, where they complete the education which they received at school. The foresight and liberality of large manufacturers have produced similar institutions in other parts of the country, and France is better provided with such schools than is generally supposed. They are, however, not so common there as they are in England, where there is a more widespread feeling of individual responsibility.

M. Marguerin thinks that every effort should be made to multiply day schools for children, and evening classes for adults, attached to large works and manufactories, in which the elements of applied science should be added to the ordinary course of primary instruction. The State could well take the initiative by attaching such institutions to the government works, as models of applied technical instruction. The boards of directors of the different railway companies, who employ so many engineers, could equally well organize schools adapted to the wants of their large staffs.

Evening
classes for
adults.

Where no large works or manufactories exist the evening classes for the instruction of artizans in applied science might well be established, and it is to be regretted that the attempts hitherto made in this direction have not met with the success which they deserve. The Polytechnic Society and the Philotechnic Society have given—the former since 1830, the latter since 1848—gratuitous courses of evening lectures on applied science, and both have received pecuniary assistance from the city of Paris, as well as from the Minister of Public Instruction. The Polytechnic has four institutions where such lectures are given, the Philotechnic three, but of all the courses only those which are installed in the Central School and at the Turgot School are in a flourishing condition, because there they enjoy the use of the large lecture theatres of those institutions as well as of the necessary physical, mechanical, and chemical apparatus. These two societies, moreover, have instituted similar courses in the

neighbourhood of Paris, at Vincennes, at Ivry, Sceaux, St. Denis, and Corbeil.

To these lectures in applied science instituted by these two societies must be added the courses of drawing applied to the technical instruction of the artizan. Such courses have been established at the free schools, aided by the city of Paris, and others, are given at a certain number of commercial schools, both lay and ecclesiastical, at the expense or with the assistance of the city. Of the six free schools, three have produced remarkable works, which were appreciated at the London Exhibition, and more recently at the Exhibition of Industrial Arts (*Exposition des Arts Industriels*), but the 44 courses at the commercial schools are far from producing satisfactory results. The city of Paris is now preparing a reorganization of these schools of design, and it is to be hoped that the liberal initiative taken by the metropolitan may be followed by the provincial cities. The English attempt to arrive at a complete instruction in drawing by a system which centralizes the schools of design throughout the country in the museum and schools at South Kensington, and by means of these schools of design to influence the style of their designers, the methods of their manufacturers, and even the public taste. It is not to be supposed that the French will be required to make so great an effort, but it may be hazardous to rely too much upon their superiority.

Courses of instruction in drawing.

Schools of design in England.

In addition to those already mentioned there are in Paris also other gratuitous courses of instruction maintained from the resources of the city; these are given also in the evening, and are held in the halls of the communal schools. They are numerous, well conducted, and well attended. But they are intended rather to give the elements of primary instruction to the numerous artizans who are drafted to Paris from the provinces, where they have either not been at school at all or have remained at school too short a time to do more than obtain the mere elements of applied science. These, therefore, can scarcely be considered as rendering any assistance to technical education.

Free lectures in Paris.

In concluding this portion of the subject M. Marguerin makes some remarks upon the condition of primary education, the insufficiency of which he considers to be the great obstacle to the extension of technical instruction. The children at the primary schools usually leave school when 12 or 13 years old, at which age it is impossible that they can have received enough elementary instruction to pre-

Extension of primary necessary to the development of technical education.

pare them for the scientific branches of education. M. Marguerin therefore is of opinion that the children should be kept at school a year or two more, during which they should undergo a more extended course of arithmetic and drawing, both ornamental and geometrical, and should receive instruction in the physical and natural sciences. In the agricultural districts the schools might be supplemented by adult evening classes during the winter and Sunday schools during the summer.

Evidence of the Rev. Father Baudime, Assistant Superior of the Christian Brothers' School.

Industrial instruction in the Christian Brothers' schools.

Drawing applied to the arts at the school of the Marché St. Martin.

Workshop established in connexion with the same school.

The Christian Brothers' schools date from the year 1709, when the first Sunday school was established in the parish of Saint Sulpice with 200 pupils. The order was re-organized by Imperial decree in the year 1808, and in the year 1815 Father Philip, who is now the Superior General, established in the school of Auray (Morbichan) a course of lectures to prepare young men for the dockyards and for the coasting trade (*cabotage*); into this he introduced the elements of geometry and other sciences connected with their professions, and he himself composed some textbooks to facilitate the studies. In the year 1830, at the instance of the Government, which was occupied with the amelioration of the condition of the working classes, schools for adults were opened by the Christian Brothers in Paris. At first the instruction was confined to reading and writing, but afterwards the rudiments of drawing were added. At this time Father Philip composed a short treatise on practical geometry applied to mechanical drawing, which contained also a summary of architectural drawing, levelling, and perspective. It was soon found that a great number of the Paris workmen engaged in the manufacture of fancy articles (*articles de Paris*) required a knowledge of ornament, and accordingly a course of free-hand drawing and of drawing from the figure was introduced. Father Baudime himself was appointed director of the drawing school in the Marché St. Martin, and here he established a collection of mechanical models by Leblanc, and adopted as textbooks the Treatise on Cabinetwork by Coulon, on Carpentry by Leroy, on Locksmiths' work by Petit, on Upholstery by Janselme, and on Stonework by Simonin. To satisfy the demands of some of the pupils, who desired to execute work after their own designs, a workshop on a small scale was erected in the school, where two evenings in the week skilled workmen,

who were themselves pupils, could give their comrades instruction in the practical branches of their trades. These attempts remain on the same modest scale to the present day, and evening classes on the same plan have been established at a dozen communal schools in different parts of Paris. Everywhere, however, the same difficulty presents itself—the class rooms being occupied all day by the children of the primary school it is very troublesome to arrange the furniture necessary for teaching drawing to adults in the evening.

The classes are divided into two divisions, one open from six to eight o'clock in the evening for apprentices from 13 to 16 years old, the other from eight to ten for workmen of 16 and above. Every year the works of the pupils are exhibited in one of the amphitheatres of the Conservatory of Arts and Trades; each work bears the name of the pupil, his age, the time of his apprenticeship, and the name and address of his master. A board, composed of manufacturers of good position, awards and distributes the prizes.

System of teaching at the evening classes.

In different quarters of Paris local committees, composed of manufacturers and persons of good position, have been formed to visit the different schools weekly, and to bring masters and apprentices into communication.

Local committees.

When a master receives a pupil of one of the Christian Brothers' schools as an apprentice, care is taken that the indentures are properly executed and signed by the president of the local committee, the master, and the father or guardian of the apprentice; thus in case of disagreement the local committee has the power to interfere. Every month a member of the order visits the different workshops where apprentices have been placed to inquire into their conduct and industry. The notes thus collected, together with those made by the Brothers on the attendance and work of each pupil at the evening school, are taken into consideration when the prizes are awarded at the annual distribution.

Apprenticing a pupil from the Christian Brothers' School.

At the time of the revolution of 1848 several of the schools of the Christian Brothers were abandoned, and many others have been with difficulty maintained; they are still, however, able to obtain situations as apprentices for many children, and the annual exhibition continues to be held, though on a smaller scale.

The lessons given at these schools are entirely gratuitous, and the masters are paid by the municipality of the city at the rate of 10 francs per annum for each pupil. There are altogether about 20,000 children of from 6 to 14 years old in the Paris schools, and 4,000 to 5,000 adults, workmen,

Primary aid from the City of Paris.

or apprentices. The latter have to furnish themselves with the books necessary at the school, and the city provides those which are given as prizes.

Success of the
Christian
Brothers'
schools.

The success of the schools with their junior pupils is considerable, and most of the scholarships for the Chaptal and Turgot Colleges, which are filled up at an annual competitive examination, are taken by them ; but perhaps the most remarkable feature is the evening classes for adults. At the school in the Marché St. Martin alone between 800 and 900 such pupils attend the classes, some of whom are men of 25, 30, 35, or even 40 years of age ; but the number in attendance is fluctuating, as from the peculiar nature of his employment the manufacturer of fancy articles has the evenings of the summer months only at his disposal, while on the other hand, a journeyman in one of the building trades is more at leisure during the winter months. The adult schools are divided into four classes, in which the pupils are classed according to their proficiency in the elements of reading, writing, and arithmetic.

Instruction in
drawing.

The following is the method of instruction adopted for teaching drawing:—At the commencement of the course the first half-hour of the lesson is employed in a lecture on geometrical drawing ; this is then reproduced by some of the pupils on the black board, while the remainder copy it into their books. During the second part of the lesson the pupils draw from copies graduated according to the ability of each. Afterwards comes drawing from natural objects ; the pupils make a sketch of an object, then take the dimensions, and produce a finished drawing of it to scale. The number of copies in the schools for such purposes is small, but, up to a certain point, sufficient for the wants of the pupils. Sometimes, when the time of the pupils is less occupied, they are taken to visit a large manufacturing establishment ; here they take rough sketches of the different tools, or of portions of the machinery in use. As regards copies for ornamental drawing the schools possess only such as can be bought in the shops, though a few designs of foliage, &c., have been expressly made by some of the Brothers.

Educational
works pub-
lished by the
Christian
Brothers.

The works published by the Brothers, and in use in the schools, are,—

1. Geometry, by Father Philip ; published in 1831.
2. A revised edition of the same ; in 1858.
3. A course of ornamental design, by Father Arcadius ; published in 1845.
4. A similar course, by Father Mance ; in 1846.
5. *Vignole*, by Father Fructule ; in 1847.

6. Course of practical geometry, by Father Rossore ; in 1850.
7. Course of outline drawing, by Father Arcadius ; in 1854.
8. Copies of outline and tinted drawings, by the same author, now in the press.

All these works not being of a sufficiently elementary character for junior schools, a series of drawing copy-books was published in 1860, adapted to popularize the drawing of ornament in all schools, from the village school to the middle-class school of large towns. In the method adopted in giving this elementary instruction in the drawing of ornament care is taken to select copies on good grounds only, that is to say, either on the score of taste or style ; every study, every fragment has a name attached to it, giving the character of the style to which it belongs. Thus, after going through the course of copy-books the pupil can easily distinguish between Grecian, Roman, Byzantine, Gothic, Renaissance, &c. orders of ornamentation, and is even sufficiently advanced to make an original design belonging to one of those orders.

Drawing from the cast and modelling naturally follows on that of ornament, but the little time which the junior pupils can devote to the subject permits this branch to be carried on only in the adult evening classes. To ornamental drawing ought to be added geometrical drawing, being of much more importance to the working classes. The method adopted in teaching this subject consists in hanging up before the class a large sheet, four feet by three, containing copies of joiner's work, upholstery, carpentry, architecture, and machines ; the pupils have by them figured sketches of these copies so as to be able to reproduce on their books these copies to any required scale. By this means a class of from 50 to 60, and even a 100 pupils can work at the same subject, and follow the explanations of the teacher. To facilitate still more the study of this subject, and in order that the pupils may have a better knowledge of what objects they reproduce, they have set before them solid models of the same objects as are on the large sheets, some in wood, others in plaster or cast metal ; the models are cut by vertical or horizontal planes, so that the details for the drawing are better understood. To these models others are added to be handled by the pupils themselves that they may make sketches of them, with different elevations and plans. By this means it has been found possible to make children of from 10 to 13 years understand the theory of projections.

Drawing from the cast, modelling, and geometrical drawing.

Christian
Brothers'
schools out of
Paris.

Other adult schools, conducted on the same plan as those at Paris, have been established at Nancy, Cambrai, St. Omer, Orléans, Rouen, Lille, Clermont, and several other towns of France; but there is one at Volvic (Puy-de-Dôme) which is particularly worthy of notice. This school has been specially adapted to the locality where it is situated, which is known as furnishing a peculiar building stone. The Brothers had had a small primary school there for some time without producing any noticeable results, until they attached to it a workshop for cutting and sculpturing stone, and induced a couple of skilled workmen in this branch of trade to undertake the instruction of about 20 pupils. Already many works of merit have been completed at this establishment, and have not only been admitted to exhibitions, but have been also employed in the construction of large edifices. Another example of what may be done in schools for furthering the industrial interests of a locality are the boarding schools of the Christian Brothers at Lyons and St. Etienne, the centres of the silk and ribbon weaving trades. To these schools are attached special classes, where the children are taught not only to design but to read and pierce the design on the cards of the Jacquard loom, as well as to work the loom themselves. Each of the schools at Lyons and St. Etienne was furnished with looms, and thus young people leaving the schools were not only instructed in theory but had also often sufficient practical knowledge to take the position of foremen. In the revolutionary year of 1848, however, the insurgents, dreading the competition of these schools, broke into them and set fire to the looms, and since then the Brothers have not repeated the attempt at special instruction.

Workshops
attached to the
school in the
Rue Neuve,
St. Etienne du
Mont.

The ateliers connected with the establishment of the Brothers in the Rue Neuve, St. Etienne-du-Mont, at Paris, is another instance of the manner in which they have fostered the training of their scholars in different handicrafts; unfortunately as at Lyons and St. Etienne they were compelled to close the institution during the revolution of 1848, and have not since re-opened it. In this establishment the Brothers had the care of the elementary education, the boarding and clothing of the pupils, but the ateliers were under the control of a local committee of manufacturers, who entered into contracts for the execution of work entrusted to them, supplied the material, and furnished skilled workmen as teachers. Such of the pupils as wished to learn a handicraft were regularly bound apprentices to this committee.

School of St.
Nicolas.

The school of St. Nicolas is managed on a similar plan to the one just mentioned. In this boarding school there

are 1,500 children, of whom about 100 attend the workshops. Two hours every morning are devoted to the education of the apprentices; that is to say, for three days in the week in elementary instruction, higher branches of arithmetic, and the mensuration of surfaces and solids; the three other days in instruction in drawing. Space for all is at present wanting, but it is hoped in time to provide workshops for the following trades—

Woodcarvers.

Gold chain makers.

Bookbinders.

Leather trunk makers.

Metal chasers.

Bronze mounters.

Makers of brass musical instruments.

Shawl pattern designers.

Gilders on wood.

Turners of optical instruments.

Packing case makers.

Bootmakers.

The workshops are under the directions of private teachers, who come in the morning and leave at night. Each pupil pays monthly 30 francs, for which sum he is boarded and clothed. In order to prevent loss to the contractor from the inferior quality of the work produced at the workshops by young hands, the teacher is permitted to introduce skilled workmen, who must produce satisfactory evidences of their capability, partly to ensure a more excellent workmanship in the work delivered, partly to assist in the instruction of the pupils in manual labour. Those of the pupils of the institution of St. Nicolas who do not elect to enter the workshops leave the school at the age of 14 years. The Brothers are, however, permitted to keep a number, not exceeding 60, until their 16th year, the two extra years being devoted to instruction in book-keeping, accounts, and other subjects useful in commercial pursuits.

The mass of the children who are taught at the St. Nicolas institution belong to the working classes; they are the sons of small tradesmen, or of journeymen; in every case of parents who find it difficult to earn a livelihood. It is impossible for people in this station of life, after paying for the education of their children, to pay in addition for their indentures as apprentices, and thus, unless they enter the workshops of the school, they are compelled to find employment in small private workshops, when they are exposed to every kind of moral temptation.

The horticultural schools of Issy (for 20 children) and Igny (for 60 children), in the neighbourhood of Paris, were established by the Christian Brothers to counteract the tendency of the population of the rural districts to gravitate to the large towns—thus producing a scarcity of hands for agricul-

Horticultural schools.

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tural labour,—by giving rise to a counter-current, and by creating a desire for horticultural pursuits to attract the suburban population to the country districts. Though they have not succeeded in this object, they have been enabled to turn out a number of intelligent young men, able at once to undertake under-gardener's situations in the large villa residences and in the nursery grounds in the neighbourhood of Paris. A third establishment of the same kind exists at Clermont-Ferrand (Puy-de-Dôme), which has obtained a high reputation in the locality where it is situated; the demand for young gardeners trained at this institution is greater than the supply. The course of instruction includes the principles of drawing and geometry applied to laying out gardens. At all such establishments it is found to be a drawback that the pupils are withdrawn from school at too young an age, before they have completed their course of studies, in order that their parents may realize the profits of their labour.

Agricultural
school at
Beauvais.

The agricultural school at Beauvais, also under the care of the Christian Brothers, is intended for pupils of a higher social position. Here they are trained to become teachers of agriculture in other establishments, or they are the sons of landed proprietors, and attend the school to study the science both theoretically and practically, and to fit themselves for managing and farming their own estates. Of the first class, many have already found situations as professors, and the others carry back into their own districts a knowledge of new agricultural implements, and of the best methods of cultivating the soil. It is hoped that they will succeed in eradicating the prejudices against the modern system of farming which are so common among the rural populations.

Opinion of
Father Bau-
dime on the
means of
developing
technical
education.

In giving his opinion of what should be done to extend technical education in France, M. Baudime recommends that drawing should be taught in all rural and elementary schools, with the double object of enabling the children to make a correct sketch with facility, and of improving and developing their taste. In the large towns schools of art should be established for the use both of apprentices and adults, in which the instruction given should have special reference to the industry of which any particular town is the centre. For youths employed in factories evening classes in drawing should be formed, and the employers should be induced to give special facilities to their apprentices to attend such classes, and there to complete the elementary education they have received at the primary schools by instruction applied to the trade which they pursue. If the locality possesses a

good free school, in which attempts have already been made at industrial training, the State could by judicious assistance sustain and improve these attempts; if, on the contrary, no such institution exists, it would be more convenient to establish classes for technical instruction in connexion with the public communal school of the district, giving the teacher the means of satisfying the wants of the locality with a liberality which should prove to him that his zeal and devotion are appreciated. In either case it would be well to form a local committee of manufacturers to direct and watch over the classes—men to whom the success of the school would be an object.

As regards the introduction of manual labour into schools, M. Baudime considers it desirable to adopt the plan which is in use at the St. Nicolas Institution; schools on this system, established in the great centres of industry, could produce a constant supply of skilled workmen. It would be necessary to guard against any appearance of competing with local manufacturers, and this, as at St. Nicolas, might be avoided by inducing a manufacturer to take an apprentice-workshop on his own account, quite independent of the school, except as far as regards the supervision of the conduct and training of the apprentices.

Manual labour
in schools.

Evidence of M. Pompée, Founder and Proprietor of the Professional School at Ivry, formerly Director of the Turgot School, and Member of the Municipal Committee of Paris on Higher Primary Education, Vice-President of the Polytechnic Society.

The Ivry School follows the same system, and adopts the same subjects of instruction as the Turgot School, of which M. Marguerin has given a description; but it is strictly a private boarding school, and attended by children of a higher social position, and whose parents are in more easy circumstances than those who go the Turgot School. The terms of the school are 854 francs annually, including all scholastic necessities except washing, and M. Pompée has never received any pecuniary aid in establishing or maintaining his school. The course of instruction given during each year of attendance is distinct and separate, so that if circumstances compel a pupil to leave school before the completion of his studies, he is in a position at once to apply the knowledge he has acquired. Latin and Greek are excluded from the programme, but great attention is paid to the study of the French language and literature, foreign languages, and history. It is not thought necessary to introduce manual

System of
instruction at
the Ivry
School.

labour. The method of instruction consists principally in cultivating the intelligence of the pupils, in making them acquainted with substances used in the arts, by means of numerous collections of every kind ; in giving them an insight into chemical manipulations and technical processes, by frequent visits to public and private manufacturing establishments. There are now (1863) 95 pupils, all boarders, divided into four divisions, including a small number in the preparatory class ; they are mostly children of professional men, and some are placed at the school after having commenced a classical education, which they were found incapable of pursuing. They can only be admitted to the professional studies after having received a good primary instruction, which brings the age of entering the course to 12 or 13 years, and that of leaving to 15 or 16 years, as it extends over three years. Those pupils who present themselves for admission to the school after giving up their classical studies are generally older, and then often they possess an amount of elementary knowledge inferior to that of the children at good primary schools.

The expenses of creating this establishment have been considerable ; M. Pompée has had to rent four hectares (about two acres and a half) of land, and to sink much money in conversions and fittings, in the construction of laboratories and class rooms for drawing, in the purchase of collections of natural and manufactured products, of physical and mechanical apparatus, casts, and models. There is a numerous staff, consisting of four in-door masters for the supervision of morals and the maintenance of discipline, and 10 daily masters, each of whom teaches only a special subject ; the salary of the latter depends on the disbursement each has to make in coming to the school, and the length of time he is employed. Notwithstanding all these expenses, the number of pupils has always been sufficient to render the undertaking a remunerative one.

Success of the school.

M. Pompée finds the results of the instruction and the success of his pupils to be most satisfactory. The methods adopted are of a character to keep the attention always on the stretch, and boys whom want of success in their classical studies has rendered dull, apathetic, and idle have recovered at the Ivry school all their activity of mind ; their reasoning powers are awakened, they take an interest in their work, masters have not to punish, nor parents to complain. The employers under whom they find situations on leaving school are the first to discover the great difference between pupils trained on this plan and those who have received a classical education.

On the whole, M. Pompée thinks that the tendency to attend special rather than general instruction is rapidly increasing in France, notwithstanding its present incomplete organization. Even in the university the inspectors-general have had occasion to remark the constant augmentation in the number of those who attend the special classes; in 64 out of the 74 Lycées, and in nearly all the Communal Colleges, special instruction has been instituted, and is attended by one-sixth of the whole number of scholars—3,312, according to the last reports. A similar result has been established in Belgium. In that country the system of instruction given at the Athénées, which correspond to the French Lycées, was, up to the year 1850, exclusively classical. When this was modified by the law of the 1st of June of that year, there were in all 2,441 scholars attending these schools. The modification introduced by the 21st article of the law consisted in establishing in each Athénée two parallel courses of studies, the one classical, the other commercial, it being left to the parents to decide which course their children should adopt. At first the separation took place in about equal numbers, as (excluding the Athénée of Brussels, for which there is no return) on the 1st October 1851 the numbers at the nine other Athénées were, 1,105 scholars in the commercial and 1,190 in the classical division. After this date the progressive condition of the two courses of study may be seen in the following table:—

Years.	Numbers attending the Athénées.	Divisions.			Difference.
		Preparatory.	Commercial.	Classical.	
1852	2,516	98	1,234	1,184	50
1853	2,476	85	1,224	1,167	57
1854	2,530	71	1,339	1,120	219
1855	2,561	514	1,167	880	287
1856	2,494	512	1,196	786	410
1857	2,602	517	1,279	806	473
1858	2,847	621	1,376	850	526
1859	2,891	617	1,389	885	504
1860	2,939	636	1,417	886	531

Comparing these numbers, we see that in the period of nine years, notwithstanding the annual increase in the number of scholars (2nd column), and not taking into account the figure in the preparatory division (3rd column), where no separation between classical and commercial takes place, 1st, that the number in the commercial division (4th column) has increased every year; 2nd, that the number in

the classical division (5th column) has decreased every year ; 3rd, that the difference in number between the two divisions (6th column) has always been in favour of the commercial.

The inferior course of commercial education established by law in what is called the Middle Schools (*Ecoles Moyennes*) extends at most over two or three years ; it is, therefore, less complete and less extensive than in the *Athénées*. The number of scholars attending the 49 Government middle schools was, on the 10th November 1860, 6,962, of whom 4,461 were in the preparatory divisions.

Natural history
in the Belgium
schools.

The course of studies adopted at all these establishments is in general perfectly in accordance with the views of M. Pompée ; he finds only that the instruction in natural history is too scientific, and not sufficiently developed. The master could take the opportunity, in teaching this subject, of inculcating a knowledge of raw materials, which is of the highest importance to those who are being trained for agricultural, industrial, or mercantile pursuits. He is able at the same time to introduce technological instruction by giving an account of the different processes by which natural are converted into manufactured products suited to the wants of man.

Separation of
courses of
study in the
French Lycées.

M. Pompée believed that the system of division of the course of studies adopted in the Belgian *Athénées* could also be applied to the Lycées in France, provided that the two divisions be kept perfectly parallel. They must be placed on a footing of absolute equality, so that parents may be able, without hesitation, to entrust a child to that division appropriate to his future career in life ; that if requisite, of two brothers, one may attend the commercial, the other the classical division, without perceiving on either side any inferiority.

Plan of
M. Pompée for
re-organizing
professional
education in
France.

In reply to the question as to what should be done to organize in France a complete system of professional education, M. Pompée advocates changes of rather a sweeping character. He likens his plan to a railway system, with its main-line stations, junctions, and branch lines. First, taking all the courses of study at present pursued at the primary schools, the technical schools, the communal colleges, and the lycées, he would from them construct one general course, to extend over nine years, and to be pursued by all alike, rich or poor, upper, middle, or lower class, sitting side by side on the same benches ; this would form the main line of his system ; but it would be impossible for all to reach the advanced years of the course ; just as passengers on a railway get out at the different stations, so the children who, from

pecuniary necessity or social position, are compelled to earn their livelihood at an earlier age, might leave school at any point of this course, subject to certain conditions. Along the main line he would place his branch lines, the special schools, which would take at particular periods from the general course those children who have to adopt a distinct career in life; thus, all the passengers would be admitted indiscriminately to the same train, they can book themselves for any destination, they can be carried to the end of the journey or be set down at any station they may please. If they have been put down at any station and have changed their mind as to their destination, they can continue on the same road, or rejoin the nearest branch without being obliged to retrace their steps. In other words, if such a general and uniform course of study were adopted we should see at the end of every scholastic year pupils, more or less advanced, leaving the various classes, all, according to the amount of knowledge they have acquired, able to take their proper place in the different strata of social stratification, some entering at once the factory, the counting house, or the workshop, others to undergo their apprenticeship in the agricultural, commercial, industrial, or art schools which are ready to receive them.

As regards the principal course, the subjects of instruction would be arranged progressively for each succeeding year of the nine years over which it would extend, but they would be taught in a different order and on different methods to those now adopted. Thus M. Pompée would postpone the commencement of the study of the ancient languages (of use only to the minority) until the pupil has reached an advanced class, when by reason of the knowledge he has already acquired and by the development of his faculties he could in four years complete with pleasure and interest the classical studies which now occupy the whole of his time, and leave behind them often nothing but the recollection of fatigue and annoyance. At this time—that is to say, when the pupil is 13 or 14 years of age—the others who had not determined to study Latin or Greek will either have left school altogether or have been drafted into the institutions for special instruction. By this means all will have received a thoroughly sound elementary and general education, forming a foundation for the superstructure of an extended professional or technical training.

The main system of general education must be supported by the State. If the public authorities were not to interpose, in the absence of the habit of taking the initiative and

Principal
course of
general educa-
tion.

Intervention of
the State.

of the spirit of co-operation, which are as scarce in France as they are developed in England, general education would fall into the hands of the religious bodies, an end not by any means desirable. On the other hand, special and professional education must be directed and fostered by the communes, the chambers of commerce, and the industrial societies, always with some assistance from the State. Not that the educational system is to be deprived of freedom of action, that is an element indispensable to every beginning, to all progress, to every completion; to the private efforts of individuals, either singly or associated, are due all the institutions which are now at work supported by the State. Free institutions and societies are the pioneers who clear the soil and experimentalize at their own risk; if they succeed society approves of their labour, and the State encourages and adopts them; if not the establishments are carried on with difficulty after the death of their founders. At the same time, while claiming this liberty of action for popular education, M. Pompée does not rely on it altogether any more than he would rely on volunteers to recruit the army.

Education of
apprentices
below 12 years
of age.

Of children who are to pursue handicraft trades M. Pompée believes that there already exist the means for instruction, but they must be fully developed. With regard to apprentices of from eight to 12 years engaged in factories and workshops using power, or even in workshops employing more than 20 hands, the law of March 1841 decrees in Article 5, "No child of less than 12 years may be admitted to work unless his parents or guardians can prove that he actually attends some private or public school established in the vicinity." Every child at work must until he is 12 years old go to school. In this case school and manual labour co-exist, but in separate localities. Unfortunately this regulation does not extend to children employed in small workshops or in factories not coming under the law concerning the labour of children. For children who have received the elements of general or primary instruction, which assumes an age of 12 years, the most simple and profitable training in a handicraft is the workshop and the personal supervision of the employer or his deputy. In this case industrial manufacture forms and will continue to form its own workmen. Here there is nothing to create; it will be sufficient to protect the children against the rapacity of speculators, to prevent their powers being tasked beyond their health and strength; in fact to enforce the 8th and 9th articles of the law of the 22nd February 1852 on the duties of masters towards their apprentices.

The 10th article of the same law lays down that “if the apprentice of between 12 and 16 years cannot read, write, and cypher, or has not finished his first religious instruction, the employer is bound out of the day’s work to allow him time and liberty to obtain this teaching.” But the question remains, Where shall he go to find it? It is true in Paris and some other populous towns night schools have been opened to satisfy this want; but in the majority of places no such institutions exist. M. Pompée recommends the establishment of Improvement Schools (*Ecoles de Persévérance*) for the use of apprentices who would otherwise lose the elementary knowledge they may have acquired. It would be impossible to make primary education in France compulsory under pain of fine or imprisonment; but it seems strange that a similar plan to that which is adopted for the pupils of the colleges and the lycées should not be adopted for those who can receive only elementary education. In the former secondary instruction is so far compulsory that none can be admitted to the special schools, to the public offices, nor to certain appointments unless they can produce satisfactory evidence of their having received a certain amount of secondary education.

Apprentices
between 12
and 16 years
of age.

For the education of the apprentice or journeyman above 16 years of age the law makes no provision, but those who are entirely ignorant can attend the adult schools, though these are still too few in number. Or, if they wish to obtain various kinds of special to complete their elementary education, why not imitate and augment the number of the courses continued for 34 years by the Polytechnic Society? Thus for all degrees the school would run parallel to the workshop, and workmen, whether youths or adults, would find at the side of the technical instruction of the trade they have chosen an intellectual and moral training adapted to the wants and capacities of each.

Adult schools.

Of course both geometrical and art drawing would form part of any system of general education, but it would also be necessary to establish special courses of drawing for the apprentices or workmen whose trades require accuracy and nicety of taste and feeling.

The above are the measures which M. Pompée recommends to improve and extend the special education of the working classes,—for those who have only had time or means to master the elements of primary instruction; he goes on to speak of what should be done for those who have received a general professional instruction, and who are to embrace trades or professions requiring more special

Special training of the class above the artizans.

knowledge, who are to become in fact what may be called the petty officers of industry and commerce. For those who make agriculture their profession special agricultural schools already exist, and if their number is insufficient why not fall back on the provisions of the decree of the 3rd of October 1848? The commercial schools provide appropriate technical teaching for those who embrace a mercantile career. For artists there are the Fine Arts School (*Ecole des Beaux Arts*) and the Academy of Music (*Conservatoire de Musique*). It will be more difficult to provide special instruction for those who enter the manufacturing trades, because it is impossible to create one uniform system of technical training for industry as has already been done for agriculture, commerce, and the fine arts. Where, however, a particular class of manufacture has concentrated itself in a locality special industrial schools may be well established. This has already been the case for the construction of machines (at Châlons, Angers, and Aix); for clock and watch making (at Besançon); for the manufacture of woven fabrics (at Mulhouse, Amiens, Lyon, Rouen, and Lille); for metallic, chemical, and ceramic manufactures, &c., &c. For students of a still higher social position there have been established the Polytechnic School, the special schools of bridges and roads and of mines, the military and marine engineering schools, all excellent in their way and admirably serving the purpose for which they are intended.

The attempts which have been already made and the results obtained ought to be sufficient to enable us to solve the question, Whether an apprenticeship to manufactures in the special school is preferable to one in the workshop, the factory, or the laboratory. Whatever may be the solution of this important problem, there will always be a considerable number of youths who on leaving the general secondary schools will at once enter the employment of farmers, merchants, bankers, builders, chemical manufacturers, architects, &c., &c., where the services they can render will be eagerly welcomed, and where the information they have acquired will enable them rapidly to make their way.

Manual labour
in schools.

M. Pompée does not approve of the introduction of manual labour into primary schools. An experience of 28 years enables him to state with confidence that the time children are at school, that is to say, from their seventh to their twelfth year, is not sufficient in many cases to allow of their learning properly reading, writing, and arithmetic. The last

year, which might be occupied with the elements of geography and the history of their own country, is generally devoted to preparation for confirmation. It is only a very few who bring away from school the rudiments of drawing. For instruction in manual labour *time* is wanting; it is impossible to select from the subjects now taught any one which could be sacrificed to it. If indeed time could be found without injuring the training in elementary schools, what kind of manual labour should be chosen? Should it be the plane, the file, the chisel, or the shuttle? And where would be room for the bench, the lathe, the anvil, or the loom? Where can be found a master capable of teaching the use of these tools, and of many others? It is true in case of necessity the use of the spade and the rake might be introduced into rural schools, but at that age it could serve rather as an athletic exercise than as a profitable training. It would be far better to devote the time to the acquirement of the elements of natural science, chemistry, or mechanics, which as agriculturists, the children could apply in after life. Of course the use of the needle should not be neglected in girls' schools, because whatever their position, all women should become sempstresses for their own families. Another strong objection to the introduction of manual labour into schools would be its great cost; the necessary enlargement of the school, the tools and machines (to be renewed with every improvement), the raw material (for which when unskilfully manufactured there would be no sale) would be sources of enormous expense. In one word, M. Pompée sums up, manual labour out of the workshop is nothing but a pastime.

Evidence of M. Delahaye, Director of the Professional School at Batignolles, Member of the Council of Headmasters of the Department of the Seine.

The pupils who attend the professional school at Batignolles are of three distinct social grades. First there are the children of rich or at least well-to-do parents; these pass through the usual course of classical study with the view of qualifying for a university degree. Then there are the children of parents in scanty circumstances, whom an illness or an accident may reduce to poverty; these receive merely primary instruction, and are destined to become apprentices to handicraft trades, errand boys, &c. Between these two there is a third class, which forms the majority of the pupils at this school. These children remain at the school until they are 15, 16, or even 17 years old, according as their

Social position
of the pupils
who attend the
school at
Batignolles.

parents can afford the time and money. The best of them go up to the Schools of Arts and Trades (*Ecoles des Arts et Métiers*) of which the examinations form at once the aim of the pupils at the Batignolles school, and the standard up to which the studies of that school are raised and maintained.

Statistics of
the school.

The school contains 206 boarders, who pay each 550 francs up to 10 years old, and 650 francs above that age, and 130 day pupils, who pay 10, 12, and 15 francs per month. Notwithstanding that it is situated in close proximity to the Chaptal College and at a short distance from the Lycée Bonaparte, this school (founded 17 years ago, and since enlarged) is for the last six years always full, and that without publicity of any sort.

Plan of studies.

The following is the plan of the studies:—From the age of seven to that of 11 or 12 years the pupils receive primary instruction; above that age they pass through four classes, called the commercial and industrial classes, in which the lessons are graduated according to the ability of the pupils, and which keep them until they are 16 years old. This is about on the level of the preparatory course at the Schools of Arts and Trades; but pupils who do not proceed to these schools must also learn history and geography, the elements of literature, of physics, and of chemistry, natural history, technology, and accounts.

Manual labour
in the
Batignolles
School.

Manual labour (but only working in iron) is introduced into the school, but it is confined to pupils who are to pass into the schools of Châlons and Angers; for their use a workshop has been fitted up and furnished with every necessary. The hour fixed for instruction in this subject is seven o'clock in the evening, when the school work of the day is over, so that if the labour fatigues the pupils they can at once retire to rest. Formerly the boys used to frequent the workshops of manufacturers in the vicinity of the Western Railway Company (*Chemin de Fer de l'Ouest*), where they were gladly accommodated; but it was found that they returned to school weary and tired, and too sleepy to pursue their studies in the evening; their morals also suffered by being brought into contact with the workmen. For the other pupils the parents themselves do not desire instruction in manual labour; on the contrary, they are anxious to see their children elevated above the level of mere handicraftsmen. M. Delahaye himself felt at first a great repugnance to the introduction of manual labour into the schoolwork, fearing it would have an injurious effect on the habits and industry of the pupils and on their love for their studies; he only consented to it on condition that it should be confined to those who were to enter the Schools of Arts and Trades.

Great importance is attached to the teaching of drawing, so much so that the boys of seven years old commence to learn drawing at the same time that they begin to learn to write.

A peculiar method is adopted in this subject, which might with advantage be adopted in the primary schools. Paper ruled in squares is used, so that by the aid merely of the ruler and pen a child can make many different drawings, which, it must be confessed, are not very artistic, but which accustom him to neatness, give him a notion of symmetry, and educate his taste. When these children come afterwards to the use of the compass and bow-pen, and to tint their drawings, their hand is practised, and often very skilful.

M. Delahaye, being asked what, in his opinion, should be done to advance technical education, insists most strongly on the necessity for a diploma. When at the commencement of the century classical education was re-established, every effort was made to give it strength and vitality. The professors and teachers were endowed with liberal salaries; the pupils were attracted and retained by every kind of encouragement — public distributions of prizes, a general competition, inspections, examinations, and diplomas. Nothing of this sort has been done for the other course of study; its students have no evidence to show of their industry and ability. Professional education possesses numerous establishments; special courses at the Imperial Lycées, communal colleges, schools founded by the municipalities, private institutions under lay or ecclesiastical patronage, but it has no diploma.

A diploma could only be granted after a general examination, which would necessitate the establishment of a uniform course of study. What exhibitions do for art and manufactures examinations do for education. At present the teachers employed in giving technical or professional instruction are isolated from one another; they do not know what is being done in other quarters, they can fix no standard for the studies of their pupils, nor find any measure of their progress. All this would be obviated by one uniform programme of instruction. M. Delahaye would recommend that pupils should be admitted to examination for the diploma at the age of 15 years, when, as the dead languages form no part of the course, it might reasonably be expected that they should possess some acquaintance with mathematical science. Up to this time the course of study for the pupils, whether intended for agricultural or industrial pursuits, would be the same; afterwards it would not be too late for them to receive special instruction. The diploma, moreover,

Instruction in drawing.

Opinion of M. Delahaye on what is necessary to organize a system of technical education in France.

Necessity for a general examination and a uniform programme of subjects of instruction.

would owe its existence to the direct intervention of the authority of the State, which could not fail to excite a healthy emulation, not only of the teachers, but also of the pupils. Children are never too anxious to work, and require always a more effectual stimulant than the mere praise or blame of the teacher.

Professional education to be general.

Another advantage to be gained by the establishment of a diploma would be the thorough generalization of professional education. At present the danger lies in the subjects of instruction being too soon made special. Professional education to satisfy every one, the producer and the consumer, the manufacturer and the agriculturalist, must be general; to specialize it would meet the wants of one class only. It must have the same programme, whether in the north or in the south. In La Vendée among an agricultural, as in Alsace among a manufacturing, population; yet how can that be if it is confined specially to one object? how would it affect a family who, having been educated in the south, is compelled to migrate to the north?

M. Delahaye recommends the introduction into the primary schools of practical geometry and free-hand drawing, also the establishment of special courses for those who, leaving these schools at an early age, enter at once a trade or factory. For youths who can afford the time and money to remain at school to their fifteenth or sixteenth year, he demands a general education, defined by a uniform programme—an education which will not prevent them from adopting special paths in life, but which will assure to them an effective and intelligent intellectual training.

Evidence of M. Bardin, Professor of Industrial Drawing to the Communal Schools of the City of Paris.

Organization of the school of Toulon.

In 1853 M. Bardin was one of the promoters of the Southern Professional School (*Ecole professionnelle du Midi*) at Toulon. This school at the commencement was tolerably well received by the local authorities, who voted a sum of 6,000 francs for the purchase of materials. From the Ministry a grant of 6,000 francs was received as aid towards the payment of the teachers, 3,000 francs of which were for the director, 1,200 francs for the professor of mathematics, 1,200 francs for the professor of drawing and head of the workshops, and 600 francs for a foreman. The terms for boarders were 600 francs a year, and for day scholars 160 francs (this last was only 70 francs at the College of Toulon). The director of the Professional School, who was left entirely to himself,

and without any control over him, collected the money from the pupils, regulated the expenses, drew up the programmes, superintended their execution, and taught the French, English, and Italian languages.

The school was composed—1st. Of a preparatory division comprising two classes, the aim of which was to complete the ordinary elementary tuition and to lay the foundation of superior primary instruction;

2nd. A special division, in which was given literary and scientific instruction, and instruction applied to the practice of the workshop, the whole during a course of three years' duration.*

The maximum number of pupils who have attended the school were, during the third year, about 100, 50 of whom were boarders and 50 day pupils. They were received in the preparatory division from 10 years of age; those in the special division were from 14 to 20 years of age.

This school having lasted but three years and a half, only one series of pupils was able to terminate the studies of the special division; all these are at the present time well placed, some in great industrial establishments, others as contractors or tradesmen; their actual position is analogous to that of the best pupils of the Schools of Arts and Trades who are employed in industry. These good results, which have only been able to be proved the last few years, were not even foreseen by the public when the school was in existence. It ought to be added that in its last year it had lost much in general estimation by some of the pupils having been refused by the Commissioners for the examination of the candidates for the School of Arts and Trades at Aix. These youths were perfectly prepared, and would have done honour to the School of Toulon, but the pupils of the colleges, who were examined by their own professors, were preferred before them.

Satisfactory results.

It must be remarked that the position of this school has Indefinite position one of

* The literary instruction comprised the following studies:—Moral and religious tuition, the French, English, and Italian languages, the history of France, and commercial geography.

Scientific instruction:—Arithmetic, elementary geometry, descriptive geometry and its applications, algebra, trigonometry, analytic geometry, machinery, chemistry, and natural philosophy.

Applied Instruction:—Technology of the industries of the South, architectural construction, machine manufacture, commercial and industrial accounts, industrial drawing.

The labours in the workshops were:—Engine fitting, iron turning, joinery, modelling, carpentry, wood turning, stone cutting, and modelling of ornaments.

Works of small dimensions were intended to help to form a museum for the instruction of the pupils.

the causes of closing.

never been well defined. The State gave an annual subsidy, and paid at the same time 15,000 francs for the appropriation of the premises, which were thought to be hired by the town, but which the director had taken in his own name. Being pressed to alter such an anomalous situation, the municipal council at last consented to pay the rent; but this liberality was not of long continuance, and when, upon the reiterated demands of the director, the minister commissioned the corporate body to re-organize the establishment, there was a formal refusal on the part of the town. On the other hand, the Department, which had shown its co-operation by a grant of 4,000 francs, could not take the entire responsibility of a school abandoned by the corporation of a town containing 80,000 souls. The minister then withdrew his subsidies, and the director took the determination to suspend the classes and send away 80 pupils (March 1857) rather than keep it open as a private school, although certainly a good organization would have assured its success. When this school was closed it was only a few thousand francs in debt for rent.

Statistics of the drawing classes in Paris.

Instruction in industrial and art drawing is given to the apprentices and workmen of the capital in the establishments kept by the Minister of State, by different associations, and by the city of Paris; besides which there are classes for workmen and free establishments.

They may be classed as follows:—

	Number of Schools.	Number of Pupils.	
		Art Drawing.	Geometrical Drawing.
1st. Imperial and special school for drawing (gratuitous) - -	1	320	150
2nd. Courses of the polytechnic and philotechnic societies - -	5	120	60
3rd. Schools for workmen and private establishments - - - -	5	100	400
4th. Ecclesiastical communal schools -	15	700	200
5th. Lay communal schools - -	18	1,000	250
6th. Private schools receiving subsidies from the town - - - -	6	530	20
Total - - - -	—	2,770	1,080

Therefore, for artistic and geometrical drawing there is now a total of 3,900 pupils. The number of pupils admitted in the course of the year is about 10,000.

Imperial of

1. The imperial and special school of drawing is dependent upon the Minister of State; it is completely gratuitous, both

for those who attend it in the day and in the evening. The day instruction, which is from eight in the morning to one, consists of mathematics and drawing.*

The students are mostly pupils for architecture, sons of contractors, makers of objects of art, and young men who are preparing for the different branches of study of the School of Fine Arts (*Ecole des Beaux Arts*). The class rooms are well adapted for the purpose for which they are used, and the models put before the pupils are well chosen.

The evening classes,† which are intended for young men and workmen who have no time in the day, are well arranged and the tuition is very good: they are of great value. Geometrical drawing is limited to that which applies exclusively to architecture, and no one under 15 can frequent the school.

The number of pupils who attend the courses, both in the daytime and at night, are from 400 to 500, about 250 of whom are very regular; from 1,200 to 1,500 are admitted in the course of a year. A great number of the pupils attend several courses at the same time. There are 15 professors and assistant professors.

2. The Polytechnic Association keeps up several classes of artistic and industrial drawing, which appear to be meant to complete the scientific instruction given gratuitously by the association. The number of free pupils in the classes actually working is about 50 for art drawing, and 20 for geometrical drawing. The Philotechnic Association has also two

Classes of the Polytechnic and Philotechnic associations.

* The principal subjects taught, and the number of pupils who actually attend them, are:—

Mathematics, geometrical drawing	-	-	-	60
Art drawing (copy), ornament, plants, animals, figures, academy studies	-	-	-	100
Drawing from memory	-	-	-	20
Drawing from the cast	-	-	-	50
Drawing from nature	-	-	-	80
The modelling of ornaments and academy studies	-	-	-	40
Engraving on wood	-	-	-	20
Total	-	-	-	370

† The subjects of instruction, and the number of pupils who attend them, are as follows:—

Geometrical drawing	-	-	-	70
Architectural drawing	-	-	-	80
Artistic drawing, copy of figures, animals, plants	-	-	-	180
Drawing from the cast	-	-	-	50
Drawing from nature	-	-	-	80
Ornamental composition	-	-	-	20
Modelling of ornaments and academical studies	-	-	-	50
Total	-	-	-	530

classes, the one for artistic, the other for industrial drawing. In each of them there are three lessons a week given by different professors, independent the one of the other. These courses are especially attended by pupils who follow some of the other classes of the association. About 70 pupils attend the classes of art drawing and 40 those of geometrical drawing.

Schools for
workmen and
private estab-
lishments.

3. Journeymen carpenters meet together in the winter in rooms, that is to say, in the room of one or the other of them, or in an apartment hired in common, to study outlines under the direction of a head workman, who gives his evenings gratuitously to instruct his fellow workmen. Stonemasons have also schools of this sort, but in very small numbers; some are gratuitous others require payment. Those in which the masters demand a sum of 8 or 10 francs a month are generally attended by workmen to whom the stonedresser promises work during the bad season.

Studies pursued by workmen in common have this good in them, that they give them practice. The sketches copied by the pupils are afterwards applied, that is to say, that each workman executes the subject of which he has drawn the outline on a small scale, and it is often only after having completely terminated it, that he thoroughly understands his sketch; but even though it might have been understood from the commencement, the cutting of the model is very useful, for it necessitates the tracing of the pieces and the finding out the order in which they are to be executed. These schools, of which there are but few in Paris, only give instruction in two or three trades; they, however, as well as the trades union societies, have a tendency to disappear.

Some clerks of works or architects have also evening schools for masons, contractors' clerks, &c.; the drawing they teach is specially adapted to the trade of each; the terms are usually six francs for a month of the course, which comprises six lessons a week, of three hours each. Some of these schools have a name amongst the workmen, although their practical teaching is otherwise limited. In the absence of all statistics of these schools, the number of pupils who attend them may be fixed at about 500.

Drawing in
ecclesiastical
schools.

4. The city of Paris has instruction in art drawing given to apprentices and workmen in 15 communal schools, kept by the Christian Brothers; this is generally composed of the copy of ornaments and heads, also drawing from the cast; in 10 of these last they have mechanical drawing as well; the number of pupils attending the classes in art drawing is about 700, whilst for geometrical drawing there are only about 200. Two of these schools

have special classes for apprentices, the others receive simultaneously artizans and apprentices. The lessons are given five days in the week, from 8 to 10 in the evening.

5. Of the 18 drawing classes which are kept up gratuitously by the city of Paris in the lay communal schools, six give instruction in art drawing alone, one of which is particularly for apprentices; 11 teach geometrical and art drawing, and one only confines itself to industrial drawing. About a thousand pupils attend the instruction in art drawing, and 250 that in geometrical drawing. All the classes are held three days a week, from 8 to 10 ten in the evening. The young men who attend them are generally apprentices and workmen of different trades, some are clerks of architects, contractors, surveyors, draughtsmen, and designers.

Drawing in the lay communal schools.

There does not appear to be any disadvantage in causing both workmen and apprentices to meet in the same class, for apprentices rarely understand the utility of application, and they are encouraged by the industrious workmen who frequent the classes.

Mixture of apprentices and workmen.

As regards the schools for industrial drawing, of which M. Bardin himself has the charge, one is in the Rue du Bac, and receives apprentices and artizans, who can also learn there art drawing; the other, in the Rue du Renard-Saint-Merry, (quartier de l'Hotel de Ville),* gives industrial drawing alone; the first dates from February 1859, and has upon an average for the whole year 60 pupils present; the second, opened in October 1860, has on an average 50 pupils.†

Schools for industrial drawing.

* The school in the Rue du Bac, being situated in the centre of the Faubourg Saint Germain, draws its pupils from the distant *quartiers*, principally from Gros-Caillou, Vangirard, and the Boulevard Mont-Parnasse.

The school in the Rue du Renard-Saint-Merry is in the centre of the locality where are manufacturers of the fancy articles (*articles de Paris*), jewellery, and silversmith's work; it does not render as much service as it would if it was in an industrial *quartier*, in the proper sense of the word.

† The number of pupils inscribed in the two schools since their opening is as follows:—

Pupils grouped according to the Nature of the Work.	YEARS.						
	1859-60.	1860-61.		1861-62.		1862-63.	
	Rue du Bac.	Rue du Bac.	Rue du Renard.	Rue du Bac.	Rue du Renard.	Rue du Bac.	Rue du Renard.
Ornament - -	67	77	—	82	—	75	—
General drawing - -	17	21	48	25	39	23	55
Construction - -	10	11	16	20	23	26	17
Workers in wood - -	22	29	7	38	16	39	23
Workers in iron - -	24	32	31	45	37	48	36
Total - -	140	170	102	210	115	211	131

Apprentices
more numerous
in artistic
trades.

If the number of apprentices and workmen are compared, we shall see that the one about equals the other; but there is this difference, that for artistic trades the number of apprentices is about double that of the workmen; whilst, on the contrary, the number of artizans is far more considerable in industrial trades. The reason of this difference is that in all artistic trades the apprentices require drawing from the very beginning, whilst for the working of wood and iron they are generally only employed in common work and filing; the outlines which are necessary are done by workmen. As many of the children when they leave the primary communal schools have not the least notion of drawing,* and as

Ornament.—Tapestry workers, pattern drawers for embroidery, chasers, engravers, wood carvers, gilders, silversmiths, jewellers, painters, ornamental and porcelain painters, tailors, pastrycooks, and bookbinders.

General Drawing.—Organ makers, lithographic printers, autographic and lithographic draughtsmen, engravers, house painters, watch makers, and draughtsmen.

Construction.—Masons, stonemasons, surveyors, architects, clerks, &c.

Workers in Wood.—Joiners, cabinet makers, carpenters, and coach-makers.

Workers in Iron.—Iron plate makers, locksmiths, mechanics, plumbers, blacksmiths, turners in metals, mathematical instrument makers, and watch-makers.

* Programme of elementary instruction in the Department of the Seine.

WEEKLY TIME TABLE.

Subject.	1st Class.	2nd Class.	Observations.
Moral and religious instruction	5	5	
Reading	4	10	
Writing	3	10	
French language	5	—	{ Orthography. 5 hours for the most advanced pupils.
Arithmetic and metrical system	5	5	
Linear drawing	3	—	{ 5 hours for the most advanced pupils.
Singing	3	—	
History and geography	2	—	
Total	30	30	

There is a question of replacing a part of the writing lessons by linear drawing for the most advanced pupils in the time table of the second or elementary class. In the first class, three hours, and afterwards five hours a week are given up to mechanical drawing.

1st. *Primary lay schools.*—In the greater number of schools the programme as regards drawing is a dead letter; they either do not do any at all, or they teach the bare elements of ornamental drawing. Some others are limited to the tracing of geographical maps; in others it is the mask for architecture and machines, which is most taught; in other places the attention is given to academy studies with the two crayons. The Administration, however, fur-

The teaching
of drawing in
the primary
schools in
Paris.

they do not then feel the necessity of learning it, they do not come to the classes till they are 15 or 16; ashamed of being ignorant of the first principles of their art, many at this age begin to work seriously to make up by their assiduity for the time lost.

Industrial drawing as taught in the schools under the direction of M. Bardin comprehends, as principles common to all the pupils, the study of descriptive geometry and that of solid bodies; then comes drawing adapted to each trade.

Models with descriptive texts.

The results that were obtained in the first few years were extremely small, for the want of good copies to put into the hands of the pupils; at the present time, thanks to the collections of drawings prepared with the view of teaching workmen, and of the new methods that have been adopted, the success has been more apparent. Unfortunately the school is located in rooms which are used for several different purposes; notwithstanding this inconvenience, however, beginners make such rapid progress that they are soon able to understand the explanations of geometrical exercises. It may sometimes happen that these explanations are not perfectly apprehended by the youths who have been badly prepared, and are consequently not familiar with the prin-

Aplique
to different
models

Advantages of
having lay
masters for the
teaching of
technical
drawing.

nishes, upon the demand of the teachers, compasses, rules, and squares for the mechanical drawing; but of method, there is none. The programme does not speak of drawing of ornament, but a few models are provided for it, and it is done a little in all the schools, because the programme of entrance to the Chaptal College and to the Turgot School requires the execution of a drawing of ornament, and the pupils of the communal schools take part in the competitions for admission to these establishments.

2nd. *Ecclesiastical schools.*—In the ecclesiastical schools the masters are better able, by their position, than laymen, to do what is really useful; they write text books for use in their own schools, and especially text books on the drawing subjects. Both ornamental and linear drawing are taught at their schools, but not very efficiently, and the results that they obtain are only moderate; instead of acquiring good, solid, well-developed principles, the children lose time, which is very precious, in copying from models, elevations of houses, churches, and complete machines. Locomotives, shaded, are in great favour, but the teacher, who, by his position, is not acquainted with manufactures, is not competent to understand the movement of the different pieces which compose them. The only visible result of this work is to flatter the parents who, upon these matters are very incompetent themselves, by showing them the little master-pieces of children of 12 years of age. All this requires reform.

Good instruction in drawing in the primary school would have considerable influence upon the professional prospects of apprentices, for, if they had the feeling of its value when they leave school, and even before entering on their apprenticeship, they would more assiduously attend the evening schools, of which they do not now know all the importance.

What good drawing ought to be.

The course of drawing in the primary schools ought to be general; it ought to be applied so as to give the principles of art drawing as well as geometrical drawing; and without employing more time than is marked in the programme, the well-trained teachers having at their disposal proper models, would certainly obtain good results.

ciples, but at any rate they soon learn to understand that geometrical drawing does not consist alone in a single copy or in drawing to a given scale ; and, as all the models that are put before them are accompanied by a descriptive text, each of them comprehends and retains what he studies. He can work alone, the professor has only to correct the work or to explain a point which has not been understood at first. These models, thus explained, have an immense advantage over an engraving which does not even bear an indication of the drawing that it represents ; besides which a text accompanying a drawing is always more precise than the oral description that the master can give to each pupil, and helps to keep alive the remembrance of it.

Applications
to different
trades.

As soon as the general instruction is terminated, the pupils are grouped according to their trades ; workmen in wood, in iron, builders, &c. It is then only that each one learns the drawing bearing on his trade, at the same time that, in succession, they pass an hour at the black board in order to learn to sketch the objects, parts of machines or scarves which have reference to their trade.

Advantages of
having lay
masters for the
teaching of
technical
drawing.

In reply to the question as to the analogy between the instruction given in the schools of the Christian Brothers and that in the schools which he directs, M. Bardin states that the schools themselves are alike as to the organization of the classes ; they are all communal and gratuitous to the pupils, apprentices, and artizans who attend them ; the town undertakes the expenses of the premises, material, and lighting. But there is an immense difference in the instruction ; for, in order that drawing may be useful to the working population, the professor must not only know that art, and how to teach it, but he must also have an exact idea of a great number of trades ; this is why laymen succeed so much better as teachers than ecclesiastics. The instruction to be given to the pupils is multiform and ever varying ; each artizan requires to know special things, and desires for this reason to follow those studies which bear completely upon his business, and these are so different that, in a school of a hundred pupils, there are hardly to be found 10 of the same trade.

Lay professors are all artists, painters, sculptors, or art workmen, knowing not only how to draw, but understanding manufactures also ; they can consequently direct the instruction of their pupils with a view to their special needs. Though until now the communal schools have only produced a few good results here and there, the bad accommodation is the cause of this ; they have no special rooms, proper material, good lighting, or sufficient number of models. Some of the ecclesiastical schools are much better furnished than ours ; they

have rooms for the purpose, well situated, and the most complete collection of models that it is possible to procure in the present day. Notwithstanding this, their results are inferior for the reasons that have been pointed out, and those which have no special accommodation produce no results at all, especially in geometrical drawing.

Ecclesiastics are capable of instructing the children of the elementary schools, even of teaching general drawing; that is to say, drawing which relates to science only, without any practical application. In this way the studies that apprentices and workmen pursue with them can only be general and elementary, but when these teachers attempt to go beyond the elements, they miss their aim. And this is not astonishing, for they are neither artists nor handicraftsmen, and for the most part have not followed any special studies. In Paris, excepting two or three of the Brothers, who are looked upon by their order as masters of drawing, they are not in a position which could allow of their turning out distinguished pupils. We must not then seek for technical instruction for apprentices and artizans at the hands of ecclesiastics; they do not possess it, for they have not studied those numerous trades that are to be met with in practical industry. Skilled workmen who attend to complete their artistic and technical instruction, and foremen seeking for information to commence a new work which presents serious difficulties to them, are not to be found in their classes. As to the number of apprentices who frequent their courses, it is entirely explained to those who know that the Brothers have 40 communal primary schools (without counting those that are kept up by the parishes), and that they give elementary instruction to about 12,000 children, whom they afterwards enrol in the different societies of which they are the head, and whom they have no difficulty in making attend their classes for apprentices.

Incompetence
of clerical
teachers.

There are different causes for the irregularity of the attendance: at certain periods their work prevents the pupils from coming to the classes; sculptors, mechanics, joiners, and locksmiths only attend in the winter.

Irregular
attendance of
apprentices at
the classes.

Apprentices might very well come to them all the year round, but they leave them in the summer out of carelessness, and that they may follow the example of the workmen. The professors have no hold upon them, and have no power to retain them, and, with very rare exceptions, they do not find either in their parents or their masters sufficiently intelligent and zealous auxiliaries.

If the workmen paid, however small the sum, they certainly would be more regular in their attendance at the drawing

Disadvantages
of gratuitous
instruction

as regards
punctuality.

classes than they are now, and the instruction would be regarded more earnestly by them; this is a fact which has been attested by experience. This system has, besides, numerous precedents; the workmen in their practical courses take upon themselves the expenses of the premises and lighting; the private schools receiving subsidies from the town, have about 350 pupils who pay; moreover, a great number of workmen who enter their names for the courses of the communal schools come with the intention of paying.

The only objection that could be made is in favour of apprentices, because they earn nothing; this is true, but for those whose families could not afford these expenses the masters, who give a little money every week to the youths working for them, as a recompense, would willingly pay the monthly fee of the school (which might be as low as possible), and would also undertake to see that the apprentice profits by the advantages offered to him.

Salary for the
professors of
the municipal
schools of
drawing.

The professors of the lay schools, and the Brothers who teach drawing, receive a grant, which is regulated by the average number of pupils present at the classes, at the rate of 10 francs a year for each pupil. In case of illness or of holidays the professor is obliged to give up the whole of his salary for the time to the person who supplies his place. The salary varies from 200 to 2,000 francs, according to the position of the school where the drawing classes are held.

They amount annually about as follows:—

ECCLESIASTICAL SCHOOLS.

	Francs.
1 class to about 2,000	
1 „	1,200
1 „	800
4 „	550
3 „	300
4 „	200

LAY SCHOOLS.

	Francs.
3 schools to about 1,200	
4 „	1,000
4 „	600
1 „	400
6 „	300

Private schools
receiving sub-
sidies.

Independently of the courses of drawing kept up by the ecclesiastical and lay schools, the town gives grants to six schools, which contain about 550 pupils (2nd, 3rd, 4th, 10th, 11th, and 12th arrondissements). They all of them teach art drawing; at three of them the model of figure and ornament; the schools of the 3rd and 10th arrondissements have a course of drawing from nature, and that of the 3rd arrondissement completes its instruction by a course of anatomy. These schools, which exist since 1835, have each of them grants of 3,000 francs from the town on condition that they will give gratuitous instruction to 60 pupils; those

of the 3rd, 10th, and 11th arrondissements, have above this a fixed sum for gas.

All the expenses, such as rent, providing and maintaining the apparatus for light, the purchase and care of models, lithographs, busts, and other necessities are at the charge of the directors. The classes of the 3rd, 10th, and 11th arrondissements, receive pupils who pay two francs a month for three lessons a week, and three francs for six lessons of two hours in the evening. The courses of the 2nd, 4th, and 12th arrondissements have only three lessons a week each. Some of these schools, for example those of the 3rd, 10th, and 11th arrondissements, obtain very satisfactory results.

Drawing schools giving special instruction adapted to each trade would render excellent service if they were well organized and the work well arranged; under these circumstances they would be attended by a great number of young men employed in machine works and factories and by apprentices and artizans. The young men would obtain a technical instruction for which they would find daily application. Apprentices, whose intelligence would come to the help of their skill, would comprehend better and execute more accurately the works which were confided to them, and would make more able workmen. Some of the workmen might become the partners or the rivals of many small tradesmen who only owe their position to their fortune, while the greater number would have the level of their technical instruction raised, and the execution of the works which they turn out would be considerably improved.

M. Bardin, replying to the question what should be done to improve the drawing schools in Paris, says:—"About two years back I most seriously studied the question of the improvement of the drawing schools of Paris, and the conclusions to which I then came are, in my mind, the only practicable ones. If we do not take into account the pupils who attend the classes of the Imperial School, and those of the workmen's schools, there remains a contingent of 2,700 pupils, apprentices, and artizans, 1,700 of whom are for art drawing, and 450 for geometrical drawing, attending the courses of the city of Paris. These schools in their present position hardly appear susceptible of a beneficial organization; for special premises, which are quite indispensable for this kind of teaching, are wanting or are not to be found. The schools are too numerous to be well furnished with materials, and each of them, whether attended by many pupils or not, has but one professor. Such a professor can undoubtedly give general instruction, but, for special teaching, could undertake very few trades; hence it follows that

Importance of technical drawing schools.

Desirable re-organization of the drawing schools in Paris.

Project of improvement of drawing schools according to the kind of industry.

geometrical drawing, taught by artists in the 10 schools, is a failure."

"The private schools which receive grants are really special schools; but I do not think that by augmenting them we should find a remedy for the evil I have pointed out. The most profitable to their directors are those that have very few pupils, for, in this case, the expenses for rent are small, and the outlay for material and models is scarcely anything. For those, on the contrary, that render great services and that have from 100 to 150 pupils, the expenses of rent, material, and models are important. We cannot admit that the same professor could watch over 150 pupils at the same time, and could teach them properly in the two hours only that each lesson lasts ornamental drawing, heads, flowers, landscape, ornamental and head drawing from the cast, modelling of ornaments, heads, and academic studies. The directors ought to have assistants, but these assistants can only be expected to render service if they are sufficiently paid, and this is not possible in the actual state of things."

"The helpless condition of the existing schools, and the necessity that exists, and that becomes more and more pressing, for all industries to have well instructed foremen and skilled workmen, render it impossible to hesitate to demand a largely extended organization of drawing schools in Paris."

The advantage of transforming the schools which receive grants into special schools of the town.

"The transformation of the actual courses into special schools created by the town, or by the Government, or rather by both, for which the pupils, workmen, and apprentices would pay, would solve the question. Twelve special schools would suffice under the present state of things. They would be sufficient for all the *quartiers*, so that the pupils, for the most part, would not have more than a quarter of an hour's walk to go to them. Then the 2,700 pupils spread over these 12 establishments would give to each of them an average of 225, without taking into account those who do not go to drawing because they do not find instruction to suit them, and who flock to better schools where the teaching is more complete."

Project of arrangement according to the kind of industry.

"It would be very easy to manage that each school should, by its situation, answer to the particular industry of which it was the centre; thus, the one in the quartier Saint Denis should take especially engravers and chasers upon metals, jewels, and precious stones; that of the Marais, jewellers; of the Faubourg Saint Antoine, cabinet makers; of the Faubourg du Temple, bronze workers; of La Chapelle, mechanics, wheelwrights, and locksmiths; of Gros-Caillou,

mechanics, locksmiths, and joiners; of the Boulevard Mont Parnasse, locksmiths, joiners, and so on. Each school would thus have (besides those of different trades) a good number of workmen and apprentices of the same trade whom it would be possible to instruct properly. Each school might comprise two divisions; the one for art and the other for industrial drawing. The first division subdivided into several sections should comprehend the drawing of ornaments, flowers, animals, landscapes; the academic study from the model, cast, or nature; courses of botany, anatomy, the composition of ornaments, and also the modelling of ornaments, animals, and academic studies. The second division might also have different sections, in which would be taught the geometrical drawing of surfaces and solids, general drawing, special drawing, useful to constructors, workers in wood, iron, &c. In this way it would be possible to have courses adapted to all the different kinds of trades; of architectural construction, mechanical technology, &c., which could not be done in schools having but one master and a very small number of pupils for each specialty. Schools thus organized under fixed rules should be given over to directors as is done in England; or else professors under the immediate direction of the town or the Government might be appointed to teach in them. Their number should be in accordance with that of the pupils and their professions (whether artistic or industrial) should be chosen in reference to the wants of the different *quartiers*.

“The system of payment which appears the most rational would be that in which the salary is composed:—First, of a fixed sum, whatever may be the condition of the school; next, of a conditional sum or subsidy proportioned to the results obtained (this sum might reach at the highest to a quarter of the fixed salary).”

Project of financial organization.

“It appears indispensable to the success of certain schools that the pupils should pay fees. The premises should be specially built, and the furniture of tables, gas, &c. as good as possible. The most perfect copies (engravings, reliefs, academic studies) corresponding to the different sections of the programmes should alone be furnished to the schools. To one of the schools situated in the centre of Paris a museum of objects of art and industry adapted to instruction might be annexed, also a library of classical works, which should be at the disposal of all the other schools; at the same time it would be well to institute a permanent exhibition of the works done by the pupils. The general arrangement, lighting, material, and models for a school should cost 8,000 francs. The staff, lighting, and maintenance of the material would occasion an

annual expenditure of about 10,000 francs for a class of 400 pupils; and these would bring in, taking the lowest figure of 20 francs a year per pupil, 8,000 francs. The keeping up of each school would thus be 2,000 francs, *without including the rent*. The education of a student according to this would cost 5 francs a year, while actually, in the gratuitous ecclesiastical and lay schools, it amounts to 15 francs, and in the male schools that receive subsidies, 64 francs."

Apprenticeship has a tendency to become special with a division of labour.

Replying to the question as to what should be done for apprentices, M. Bardin thinks that the division of labour, which is so advantageous for cheap production, causes each branch of the trade to become more and more a specialty. It is stated that there is at the present time a great dearth of skilled workmen, particularly in the manufacture of philosophical and horological instruments. If the want of good workmen is discouraging to certain trades, it is also a very great disadvantage to the men only to know a little of their business, and consequently not to be able to procure work which does not exactly belong to their specialty. It is, therefore, most necessary to give complete instruction to the apprentices, but this is rarely met with in the present condition of industry. In a great number of trades apprenticeship lasts for three or four years; the master has several apprentices, the last comer of whom is, for a third of his time at least, a mere servant. He begins to work in the middle of the second year, and finishes his apprenticeship at the end of the third. He ought by this time to be able to support himself, a thing which is impossible to him under such circumstances.

Apprentices employed to run errands.

Disuse in Paris of the contract of apprenticeship.

M. Bardin is able to prove, by a statistical abstract of the apprentices who enter themselves for his classes, that only one in every fifteen is bound by a contract to his master, and *vice versa*. All the others have only verbal agreements. Some even have not any fixed time for the duration of their apprenticeship; it varies according to the trade, the age of the child, and according to whether he is boarded and lodged or not, from two, to three, four, or even to five years. In the face of such negligence on the part of the parents, there is but little to be expected from them towards the improvement of apprenticeship. Is it then to be expected that the masters will be more careful? At the same time, though things are thus in a great number of trades in Paris, happily, in the provinces apprenticeship is not quite so bad.

Desirable intervention of the societies of patronage in the contracts

There are several ways of bettering the moral and social situation of the apprentice. In manufacturing towns private societies might be formed, as at Nantes and Amiens, to draw up contracts of apprenticeship, to watch over the execution of

them, see that the apprentices attend the evening schools, and, in case of an infraction of the contract on the part of the master, take the interests of the apprentice in hand. Besides this, where small trades predominate, the Government and the Departments ought to encourage the manufacturers to create, close to the workshops for artizans, workshops for apprenticeship under the management of experienced and conscientious foremen. The youths would have no contact with the workmen, they would work about eight hours a day, would pass two or three hours in the study of drawing, and would receive besides lessons in French, arithmetic, &c.

Workshops might even be formed in which apprentices might be put to a certain number of trades. The proceeds of the manual labour should go to the profit of a contractor, who would furnish the raw material and pay a certain sum to the director for the workmanship. By the aid of this system, without asking any longer time from the parents than that which is now given to apprenticeship, the price of the workmanship of the articles made by the pupils would be sufficient to provide them with food and clothing.

If some gratuitous establishments of this kind, founded by ecclesiastics, have not succeeded, the reason is that they not being themselves in trade have not been able to dispose advantageously of the products manufactured. These charitable establishments take children very young, and they are five, six, or even seven years before they can employ them in really profitable work.*

Examination of the Rev. M. Meyer, Protestant Minister, Ecclesiastical Inspector, President of the Apprentice Mission of the Church of the Confession of Augsburg.

The first school in connexion with the Protestant Church of the Confession of Augsburg was founded in July 1847, in the Rue Neuve-Ste.-Geneviève; it comprises at the present date (1863) seven school classes accommodated in immense buildings, and attended by nearly 600 children.

Account of the schools in connexion with the Church of the Augsburg Confession.

* M. Bardin then goes on to give an account of the Science and Art Department, its organization and action with regard to technical instruction in England. He also gives a description of the South Kensington Museum at the time of his visit to England in 1863, and general statistics of the Science and Art schools in connexion with it. Since this date great modifications have been made in these institutions. A full account of the action of the English Government in aiding scientific and art instruction will be found in the "Notes by the Editor," at p. 14, and in Appendix A. at p. 163 of the preceding volume, containing the Report of the French Commission; it is therefore unnecessary to reproduce here M. Bardin's evidence on this subject.

The school fee is one franc per month, a sum manifestly insufficient to defray the expenses of the establishment, which is therefore chiefly supported by voluntary donations; it is found to be better in principle to insist on some payment from the parents, however small it may be, rather than to give gratuitous teaching. The character of the instruction is essentially professional, in that drawing and commercial arithmetic are taught in their higher branches to the boys, and sewing to the girls; the drawing includes that of ornament and geometry, and in some cases of machines; in mathematics the pupils go as far as square and cube root and algebra. Particular attention is paid to writing.

Boarding
houses at-
tached to the
schools.

In order to give children residing at a distance, and children without parents, the opportunity of attending the schools, boarding houses both for boys and girls have been established, two in connexion with the schools in the Rue Neuve-Ste.-Geneviève, and four in other parts of Paris. The boarders pass through the ordinary school course; they pay for their board in the Rue Neuve 25 francs, in two of the other establishments 22 francs, and in the remaining two 20 francs per month. This sum is just sufficient to cover the expenditure on behalf of each child; the charity has to defray the rent and the salary of the superintendent. The age of admission to the schools varies from two and a half to fourteen years; an infant school (*salle d'asile*) has been established for the young ones.

Action of the
mission after
the children
leave school.

When the children leave school the Mission undertakes the apprenticing of them, for which purpose a committee is specially formed consisting of charitable men who, themselves engaged in business, have derived their experience of life in the workshops and of the dangers of apprenticeship from their intercourse with the working classes. It is the duty of this committee to draw up the indentures of apprenticeship, and to see that they are properly executed. At least once a month some members of the committee visit the different workshops, and on printed forms prepared for the purpose make notes on the conduct, ability, and industry of the apprentices who are employed there.

Every Sunday all the children, both those at school and the apprentices, assemble in the schools for religious instruction; attempts have also been made at these meetings to give instruction in the elements of chemistry and physics. Occasionally fêtes and excursions are organized for the children, and choral societies have been instituted among them. It may be noticed that many of the elders undertake of their own accord, and out of kindness, the teaching of their younger comrades.

The Mission endeavours to maintain their hold over their pupils even after they have finished their apprenticeship and become journeymen; to enable them to accomplish this they have commenced the formation of working men's societies on the same principle as those established in Germany. The object of these societies is entirely moral and religious; they contain no political element whatever. With the same intention, and to prevent young working men from being led away by the numerous temptations which abound in a large city, a kind of lodging house, or as they call it *famille ouvrière*, has been opened in the Rue-de-Charonne by the committee of apprenticeship; here young artizans who have no family of their own are boarded at a low rate and find the comforts of a home. To be admitted to this institution, the young man must be well recommended and have testimonials of good conduct; once an inmate he must conform to the regulations and hours of the establishment. Apprentices are admitted at a fixed rate of 35 francs per month; journeymen pay for their food according to tariff, and an additional sum for their apartment, which varies according to the number of beds it contains. These sums just suffice to defray the expense of the provisions consumed in the house; beyond this, rent and furniture have been a charge to the committee. About two-fifths of the whole number of inmates are journeymen; they are eager to be admitted and are so well cared for that a great number of applicants have unfortunately been refused admission for want of room. The Mission in face of an annual deficit hesitate to enlarge the establishment. They have, however, been able to open an institution of the same sort, analogous to what in Germany is called a *Herberge*, specially for the German artizans, of whom there are many in Paris. In this lodging house, as well as in the primary school of the Faubourg-Ste.-Antoine evening classes have been opened, and want of funds alone prevents the establishment of others.

Action of the mission after the expiry of the apprenticeship.

Number of children in Paris attending school.

Professional schools.

In reply to the question as to what in his opinion is required to improve the condition of professional education, M. Meyer insists in the first place on the necessity of children being kept longer in the primary schools. In the Roman Catholic Communion they generally leave school at the age of 12 years on their confirmation; in the Protestant Church they are only confirmed at 15 years old, and he is anxious to be able to retain them at school until that age. Professional instruction cannot be commenced until primary education is completed. In the second place he desires that charitable societies which undertake the apprenticing of lads should be armed by law with greater powers; at present

Opinion of M. Meyer on the condition and wants of professional instruction.

when, as frequently happens, masters neglect or take advantage of their apprentices, the society has no legal right to interfere, and its action is limited to mere advice. Lastly, he would recommend that the apprentices should be allowed greater liberty in the evening, in order that they may pursue their studies in the night classes without being fatigued by their daily toil as they now are. Sunday also he wishes to see given up to rest, and the Sunday schools, of which he knows the benefit in England, well attended; an apprentice who goes to his master's shop on Sunday morning to clear up and make things tidy, is often under one pretext or another kept at work until noon, and sometimes the whole day.

Besides the Church of the Confession of Augsburg to which M. Meyer belongs, the Reformed Church possesses a similar mission superintended by a most eminent man, the Baron de Triquetti.

Examination of Messrs. Gaumont and Guémied, Editors of the Journal of Professional Education.

Number of
children in
Paris attend-
ing school.

In the year 1862 there were at school in Paris 143,705 children between the ages of 6 and 13; of these 121,709 attended the primary schools, while between 12,000 and 15,000 were being educated at home, at the lycées, or at the secondary boarding schools. It follows therefore that of these children only one in ten is fitted to receive what the university calls professional instruction. There is therefore great cause for inquiring in what way the present system of primary and secondary education can be modified to fill the gap which exists between general and special instruction.

Professional
schools.

There is no doubt that one of the first indispensable requirements in children who are to receive a professional training is a knowledge of the elements of the sciences, such as geometry, physics, and chemistry, in a degree adapted to the wants of any special industry. For this purpose schools on the plan of the Turgot school should be multiplied in the great manufacturing centres, Paris, Lyons, Nantes, Bordeaux, Lille, and Mulhouse. A preliminary training of this description is required even by children who are destined for the handicrafts. Every manufacturer knows the difference between an apprentice who has been thoroughly accustomed to scientific definitions and one who can merely read and write; even in learning the use of tools the former is twice as quick as the latter, besides understanding more easily the explanation of the master.

Now in considering the necessities of industry, and the conditions under which producers should be placed in order that their work may be profitable to themselves and to their country, it is evident that the originator of an idea and he who has to execute it must possess (perhaps in different degrees) both general and special knowledge, both theory and practice; they must in fact be able to speak the same language to work together for the same object. Besides as an individual rises on the industrial ladder, he must, under pain of falling, continually know more; the manager of works must possess at the same time the manual skill of the artizan, the power of dividing the work of the foreman, and the science of the engineer. On this ground therefore manual labour, which is the foundation of all industrial operations, must also be the base of professional instruction.

Need for the introduction of manual labour into schools.

It is often objected that by the reason of the great varieties of operations in manual labour it would be hopeless to find an individual endowed with an aptitude or sufficient flexibility of the organs to learn them all. But, according to the ideas of M. Gaumont and the gentlemen who think with him, the processes of all manufacturing industries can be reduced to a certain small number of identical manual operations. Thus the processes and tools employed in working in metals have many analogies with those used in working in wood; for example, whether a workman turns in metal or in wood, —whether he turns by the aid of the bow, of the foot, or of a machine moved by steam power,—the operation reduces itself to nearly the same method of manipulation. So in fitting it always depends on a correct eye and manual skill; and the individual who can fit a piece of iron by means of the file will soon fit a piece of wood with the aid of plane and chisel. Thus both in technical and apprentice schools can be taught the fundamental manual operations which are employed in all manufactures. Turning and fitting would form the practical portion of the instruction, geometry and linear drawing the theoretical part, and the elements of general technology the higher and finishing part.

Objections combated.

If we consider manual labour merely as a means of instruction it will still find a place in the technical school. A knowledge of manipulation is required in the chemical art; why should it be otherwise in a knowledge of the construction of machines and buildings? It is only possible to teach by four methods: 1st, oral explanation given by the teacher; 2nd, written explanation taken from books; 3rd, graphic explanation rendered by drawing, and 4th, practical explanation obtained from execution. Up to the present time only the first three methods of demonstration have been

Manual labour as a means of instruction.

employed, and nothing but theorists produced; the moment that it is desired to train practical men the fourth method will be added, and technical instruction will have been founded. Every technical school must admit into its course the manual labour of the workshop and of the laboratory; that is its distinctive characteristic, the cause of its existence. This principle admitted on general grounds, it becomes still more incontestable when applied to special industries; machine manufacture, building, dyeing, weaving, &c. require not only a knowledge of applied science, but also a practical acquaintance with manual operations. Thus by the side of industrial schools with general programmes there must exist special schools for particular trades, established like the first to train managers and foremen; then for a lower class apprentice schools and public courses of lectures for workmen, whether apprentices or adults.

Desirability
of providing
artisans with
the means of
acquiring a
scientific
knowledge of
their trades.

For managers and overseers the means of obtaining this kind of training are already provided. Besides the schools of arts and trades, those in the towns of Mulhouse, Charleville, Nancy, Reims, Castres, Douai, Lille, Ménars, and Marseilles have workshops attached, and should they not suffice there is no doubt that others will be established; but the artisans are not, unfortunately, so well supplied. For them there is nothing but apprenticeship, an institution condemned by moralists, political economists, and by manufacturers themselves. By the law of the 22nd February 1851 the master is only bound to teach his apprentice the practice of his trade; the latter has few opportunities of acquiring a knowledge of the applied sciences, which alone are the very foundation of industrial manufactures. It is true if the apprentice be less than 16 years old, and can neither read nor write, or has not completed his religious instruction, he can claim two hours a day to devote to school work; but the carelessness of parents, the idleness of the children, and the negligence of the masters have combined to render this part of the law a dead letter. Even the practice of their trades the apprentices do not properly acquire. In small industries the subdivision of labour causes them to learn only one branch; in large works they are placed under the care of a foreman or journeyman, who has no interest in teaching them properly.

It is not only in the primary or secondary schools that manual labour could be introduced. At Lille there is the example of a superior school to which the pupils from the colleges and lycées, sons of large manufacturers, come to be initiated in the difficulties of manual labour. So also at the Central School and the School of Arts and Trades young

men who are studying physics and chemistry must learn the manipulation.

The plan then proposed by the gentlemen who have established the journal "*L'Enseignement Professionnel*" is to form in the manufacturing towns mixed schools, where the children, at the same time that they are continuing their primary education, can, as soon as they are 12 or 13 years old, accustom themselves to the use of tools. They believe that the hours devoted to manual labour will serve as a relief to those employed merely in mental exercise. Again, parents who have to pay 150, 200, or even 250 francs premium to a master with an apprentice, will gladly keep the boy longer at a school where he is acquiring the practical knowledge which must shorten the years of apprenticeship and do away with the necessity for the premium. For children educated at the free schools whose parents are too poor to pay for an education at one of these schools evening classes should be multiplied where they can learn the theory of the facts which they have to apply in their daily work. For all such schools and classes no uniform organization can be laid down; only let them be independent of the university, and have within certain limits as great a freedom of action as can be allowed them.

Proposition
for establish-
ing mixed
schools.

In Paris the establishment of St. Nicolas, at Mulhouse the Jewish School of Arts and Trades, are examples of two different systems with the same object in view, namely, the improvement in the condition of the apprentice. At St. Nicolas 10 workshops have been opened under the direction of skilled workmen, to whom the pupils are bound apprentices, and who take upon themselves the expense of the workshop in return for the profitable employment of the children. The Brothers undertake their education and the charge of their board. In the Jewish school the apprentices go to their work during the day at the different workshops in the town, and when they return to the school in the evening receive lessons in French, ciphering, drawing, and geometry. Both at Paris and at Mulhouse the great object in view is the moral improvement of the pupils. These two schools are charitable institutions, and yet there is here, perhaps, the germ of a system which it may be well to develop. Attempts of the same sort have been made at Orléans, Nantes, &c. Many manufacturers have also given examples of what may be done for the education of apprentices, as M. Humbert at the spinning mill of Bresle at Gamaches. The majority of the manufacturers of Alsace maintain schools attached to their works; and the popular courses of lectures established by M. J. J. Bourcart at Guebwiller (Haut-Rhin)

Apprentice
schools.

are well known. As establishments more strictly technical, one may point to the weaving school at Mulhouse, the factory schools at Lyons, the courses of lectures lately organized by the Industrial Society of Amiens, and the older ones of the Industrial Society of Mulhouse. We have, therefore, specimens now in existence of every kind of establishment which can be provided for industrial education; we have the workshop in the school, the school in the workshop, the school outside the workshop. But we must hesitate before coming to any conclusion on the results which they have furnished. The establishments which already exist have had to experimentalize at their own risk, often with insufficient resources; they have had often to struggle against prejudice and opposition.

Intervention
of the State.

One great question remains to be answered—should there be any intervention on the part of the State? The reply is, Yes; but only in the character of auxiliary, not in that of originator. All pupils attending public courses of instruction should pay a small fee, to give them an interest in their work. Everywhere, where a good system of public instruction is maintained, this plan is adopted. At Mulhouse nothing is gratuitous; it is the same in all the Swiss cantons; at Paris the most frequented courses of drawing are those at the municipal schools, where a fee of from two to three francs is exacted monthly. In trade and apprentice schools the commune, the department, and the State should establish scholarships; this would be the most effectual means of encouraging these establishments, while aiding the pupils who cannot afford to pay.

Recommendations of
Messrs. Gaumont and
Guémied.

The following, therefore, are the recommendations which MM. Gaumont and Guémied make for the organization of a general system of professional education:—

1. The Government should encourage the foundation of trade schools in the large towns, or come to the aid of those which are already in existence, leaving to the founders the power of choosing their own professors.
2. Both schools and pupils should be encouraged by the establishment of scholarships and half and quarter scholarships.
3. Every trade school which thus receives Government assistance should be opened in the evenings and on Sundays for public courses of lectures. Every manufacturer should have the right (always under supervision of the authorities) of lecturing them on subjects connected with his own special trade.

4. Inspectors from the office of the Minister of Agriculture, Commerce, and Public Works should be charged with consolidating the system of technical education, and should be required to give advice on the subject of scholarships.

In reply to the question whether the State should undertake the training of teachers for industrial schools, M. Gaumont is of opinion that in doing so it would encounter many difficulties. To give special instruction to workmen, it is of much, or even of more importance, that the teacher should possess a knowledge of the trade than of pure science. It is almost indispensable to have lived the life of the workshop in order to be able to elevate the mere handicraftsman from practice to theory.

Training of teachers.

Examination of Mdle. Hautier, Directress of the Municipal Drawing School for Girls in the Rue Notre-Dame-de-Lorette, Paris.

This school is one of nine established for a similar purpose in different parts of Paris, and receiving from the municipality annual grants varying from 3,000 to 3,500 francs. Mdle. Hautier complains that the grant is very insufficient, two of the other schools have obtained from the mairie of the arrondissement in which they are situated the loan of a building for which the sum of 300 francs is deducted from the grant by way of rent, but in her own school she has to pay 2,000 francs for rent, besides the salaries of two assistants, and for attendance, heating, and lighting, all which makes her annual expenditure amount to 4,000 francs. Altogether the school numbers 120 pupils, of whom 25 are admitted as free scholars in return for the municipal grant; the others pay a fee of two francs per month, producing a sum manifestly inadequate for the proper maintenance of the school and the payment of the teachers. Pupils are admitted at from 10 to 25 or even 28 years old; among the latter are governesses out of place or women who have been compelled to give up their profession on account of its not producing enough to enable them to live.

Female drawing schools in Paris.

The students of these drawing schools are in general daughters of parents of the middle class. Artizans have not yet sent their children because they do not see in what way to utilize their labours. A labouring man does not comprehend the advantages of an industrial trade for his daughter such as they are vaunted to him; and even admitting that she is admitted as a free scholar to the drawing school, where

Position of the students.

can she learn to paint on porcelain or some other art directly connected with an industry? On the contrary, renouncing all these problematical benefits which are offered to him, the father prefers for his daughter the trade of a seamstress, where her wages of one franc a day are of immediate benefit to the family. But unfortunately this trade, though sufficiently remunerative to the child, will only bring in to the woman a daily sum of 2 francs 50 cents. to provide for all the wants of existence, a sum which the introduction of machine work is continually rendering more precarious.

Obstacles to
the success of
the drawing
schools.

On the whole Mdlle. Hautier finds that there are three great obstacles to the success of the schools of drawing.

1st. The instruction given at the schools itself leaves much to be desired.

2nd. Students who have made good progress have no opportunity of acquiring under a good master the industrial knowledge which enables them to turn their talents to account in a trade.

3rd. Even with those two difficulties overcome, there will remain a third even greater—where to find work?

Proposed
remedy.

To remedy these defects Mdlle. Hautier proposes the establishment of a female trade school which should become a link between the drawing schools and the manufacturer. This institution should be not merely a school where girls would receive an apprenticeship in the industrial arts, but also a great workshop in which, under the direction of professors, they could execute works intrusted to them by the manufacturer.

The management of this establishment should be in the hands of a directress invested with absolute power to choose the professors and teachers and to direct what trades are to be learned in the school. Under her orders there should be an employé to conduct the business with the manufacturers. A board composed of artists and the professors should examine the drawings of candidates for admission to the school, and such an examination should take place once or twice a month. After having passed their elementary studies the pupils would be required to execute under the direction of the teachers the works sent to the schools by the manufacturers; the money realized by the execution of these works would be divided between the school and the pupils. When a student has acquired a certain amount of skill, and has finished her studies, she would receive a diploma which should be a recommendation in her favour with the manufacturers when she wishes to work on her own account. All the pupils should be day pupils, and the hours of the school

from 10 to 4. The school fee might be from 6 to 12 francs a month.

With a building sufficiently large to accommodate 500 students, and with a yearly grant from the State of 20,000 francs, Madlle. Hautier considers that such an institution must be perfectly successful. She is strongly opposed to teaching females linear drawing as she does not see to what industry women can apply it; she desires to introduce into her proposed trade school instruction in painting on porcelain and enamel, wood engraving, and engraving on metal, colouring prints, &c.

Evidence of Mdlle. Marchef-Girard, Principal of the Professional Establishment for young girls in the Rue-de-la-Perle, Paris.

At this institution 80 young girls, of whom about 65 attend regularly, are prepared for obtaining employment in commercial or industrial pursuits. This preparation is given in two divisions and a sewing school; in the first division the pupils are trained to become clerks and accountants; in the second they are taught drawing and design applied to manufactures. In the sewing school there are two workshops, one for dressmaking, the other for plain needlework; both are supported by the execution of orders received in the usual way, and are under the charge of a mistress and two forewomen.

Statistics and
course of
instruction.

The course of instruction extends over three years; the school is open at eight in summer and half-past eight in winter, and is closed at six o'clock in the evening in all seasons. Every morning the first two hours are devoted to general studies, comprising grammar, arithmetic, history, geography, and the elements of those sciences which may be of use to girls; the third hour is occupied twice a week in writing, twice in drawing, and twice in vocal music. Then comes breakfast, which as they are all day scholars, the girls bring with them, and for which an hour is allowed. At twelve or half-past twelve the pupils disperse to the different special studies, some to the commercial, some to the drawing, some to the sewing school.

The drawing school is under the direction of M. Lequien (senior), and great care is taken that the pupils shall be thoroughly prepared in general drawing. At the date of this evidence (January 1864) this branch of the institution had only been opened three months, and none of the pupils were sufficiently advanced to take up art specially applied to industry; it was however the full intention of the managing

Drawing
school.

body to open workshops for this object as soon as the progress of the pupils admitted of it. The special manufactures for which these workshops would be established would be those of fancy articles (*industries Parisiennes*) such as painting on ivory, ornamentation of hand screens, blinds, &c. Should a pupil wish to adopt any particular branch of industrial art not taught in the establishment she would be sent to a regular workshop, but without being permitted to break off her connexion with the institution. In reply to a question on the subject Mdle. Marchef is of opinion that learning linear drawing has a very beneficial effect on the education of girls, as it gives them habits of accuracy and precision in which they are generally said to be deficient.

Sewing school.

The sewing school is open from twelve to six o'clock ; during the morning while the pupils are engaged in their general studies the mistress and her two assistants prepare and lay out the work. As it is indispensable that a woman should understand needlework, the greater part of the pupils in the commercial and industrial divisions of the institution pass two hours of every day in the sewing school at the express desire of their parents. Third year pupils undergo a course of instruction in cutting out. At present the amount of work executed in the sewing school is sufficient to render it self-supporting ; in the last three months of 1863 the receipts were 662 francs, and the expenditure, including the salary of the mistress, 597 francs. The proceeds of the sewing school go to the institution until the pupils are skilful enough to be considered workwomen and to receive wages.

Commercial school.

The instruction given in the commercial division extends over two years ; in the first are taught mental arithmetic and the calculation of interest, running accounts, and book-keeping by single entry ; in the second year book-keeping by double entry, a knowledge of commercial law, and the English language.

Advisability of establishing similar schools in other parts of Paris.

Madlle. Marchef-Girard, being asked whether other institutions of the same description could succeed, replied that she had no doubt there was room in Paris for three or four such schools. At present the one in the Rue-de-la-Perle receives pupils from nearly all the arrondissements of Paris, notwithstanding the obstacle of the distance they have to come. She has also received from 50 to 60 demands for admission from the country which, as there is no boarding house annexed to her institution, she has been compelled to refuse. Considering only the material success of the establishments, she is of opinion that its conversion into a boarding school could not fail to benefit it, but the teachers would lose the influence which they now maintain over the families of the poorer

classes by the girls returning every day to their own homes. To evening schools for young women she is strongly averse, believing as she does that taking young girls from their homes at night affords a great opportunity for their contracting bad and immoral habits.

The institution under the direction of Mdlle. Marchef is maintained by a society composed exclusively of ladies under the title of "The Society for the Professional Instruction of Women" (*Société pour l'enseignement professionnel des femmes*), to which each member pays a fixed annual subscription of 25 francs, though many voluntarily raise this subscription to 50, 75, or even 100 francs. The pupils are the children of small tradespeople and clerks, and of the better class of artisans; they pay a fee of eight francs per month, a sum insufficient to meet the expenses of the school, but the deficiency is made up by the society.

Society for the professional instruction of women.

Evidence of M. Maignen, Member of the Order of St. Vincent-de-Paul, and Director of the Mission for the Succour of Apprentices (Œuvre de patronage des Apprentis) of the same Order.

This Mission forms a link between the parents and the masters in apprenticing lads to various trades. The boys have not been educated by the order, but are brought by the parents to the director of the Mission, who from his having been for 18 years occupied in the work is enabled to find masters for them. He first by examining a lad endeavours to draw from him his wishes and capabilities, though in selecting a trade he finds it a great drawback that he has not had a longer acquaintance with the candidate. The next step is to find a good master, and before making a final choice M. Maignen ascertains himself by personal investigation if the information which he has received on the respectability of the master and the moral prospects of the apprentice is correct. He inquires how the apprentice will be fed and lodged, and he regulates the length of the apprenticeship according to the nature of the trade to be learned. Before, however, concluding a final contract the boy is left for a fortnight with his master on trial, during which time the apprentice can see whether the trade pleases him, and if the regulations and life of the workshop suit him, while the master is on his side able to form an opinion of his new apprentice's abilities. It is only at the end of that time, and when these conditions are found to be satisfactory, that the lad is formally bound an apprentice but the Mission do not in any way become a party to the

Labours of the Mission.

contract. Every month each apprentice is visited in his workshop by the director, who inquires into his conduct and progress.

Influence of
the Mission
over the
apprentices.

The efforts of the Mission are directed entirely to the preservation of moral and religious discipline among the boys it has been instrumental in apprenticing. It possesses several houses maintained by a lottery, which is organized by the order, producing an annual sum of about 30,000 francs, and of one of these houses M. Maignen is the superior. Every Sunday this establishment is open for the meeting of the apprentices under the care of the Mission; here they attend the services of the Church, are regaled with a frugal dinner, and join in games and other recreations. Such is the success of this institution that it is found that out of 300 apprentices placed out by the Mission scarcely more than 25 are absent from these Sunday reunions, and the greater part of these 25 are only kept away by family duties. In addition to this the Mission have established a saving's bank (already possessing deposits to the amount of 30,000 francs) and evening schools for instructing the apprentices in reading and writing.

The law of
apprenticeship
a great ob-
stacle to the
successful
efforts of the
Mission.

In speaking of the general results of this scheme M. Maignen complains bitterly of the obstacles he meets with in the present condition of the law of apprenticeship. He says:—

“Our guardianship would be more efficacious if it was not for the immorality which prevails in the workshops. We had at the commencement to struggle against the cupidity of the masters and the bad spirit of the workmen. I have paid attention to the system of apprenticeship before and since the law of 1851. Before this law we were in a very bad state, the children were entirely victims of the workshop and the master. The law of 1851 has been a great benefit to apprenticeship, not so much perhaps as a direct lever as by the moral effect which it has produced. Unhappily this law is scarcely more than permissive; it does not provide for an official inspection, consequently it has hardly any other interpreters or supporters except the societies of patronage. However, if we appeal to the law we are listened to. At first, immediately after the promulgation of the law, we were better supported. M. Piétri, who was Prefect at that time, addressed a circular to the Commissioners of Police, and commanded them to watch over the execution of it. When we had any cause to complain on behalf of our apprentices of an infraction of the law we complained to the Commissioners of Police, who drew up a minute upon which we had justice done us. But the law of 1851 has for some years fallen into disuse; the Commissioners of Police no longer enforce its execution. We can only refer to the Councils of the Prud'hommes, but in our intercourse with them (which is rare) we have had proof that they neglect the

provisions of the law, and principally those relating to the moral condition of the children and their rest on the Sunday. The Councils of the Prud'hommes are rather lax on these points. Since the law of 1851 we have obtained a pretty considerable liberty of action from the masters of the workshops, we can now protect the morality of the children. We have, however, still to combat against the influence of the workshops themselves, an influence which is contrary to all authority, order, morality, and religion, and to which the greater part of our children would succumb if we did not use the most energetic means to protect them from it. We are also sometimes in opposition to the masters, but with them we have a more satisfactory result as I am connected at the present time with 500 or 600 workshops. I have a number of good masters of whom I am sure, only the master is not sure of the workman. When any unfortunate occurrence takes place the master is quite as grieved as we are, but he acknowledges his powerlessness, and says: 'I am obliged to suffer these things or shut up my workshop.'"

Another difficulty that he meets with is that of selecting suitable trades for the children when they apply to be apprenticed. With regard to this he says:—

Difficulty in choosing proper trades for the apprentices.

"We are in total ignorance as to the value of the different trades. The parents come to us to ask us to place their children; we *do* place them, but blindfold, for we do not know whether the business that we have chosen for them is not overstocked with workmen, and whether when we have placed the child we have not still further augmented the miseries of an industry already overburdened with labour. This is a very serious question for us; our ignorance and the ignorance of the parents upon this subject often makes us put children into a business which is in fashion, but which does not know what to do with its workmen, whilst other trades very little known are in peril for want of hands without our being aware of it. I have seen masters of trades not much known come to us for apprentices to save their workshops from being at a standstill for want of hands. The parents bring their children to us and say: 'Place our children as well as possible.' Provided their children are lodged and fed they neither trouble themselves as to their capabilities nor as to their choice of a profession, they leave to us the care of choosing a business according to the talent we are able to discover in each child. Would it not be possible to have statistics which would help us in placing the children in the best trades and those in want of hands?"

With regard to school workshops M. Maignen does not think that they are productive of benefit. An apprentice can only become a good workman by seeing others at work, and by learning the large processes of manufacture. It is in the motion and life of a large undertaking that the intelligence and ability of a young man develops itself, that he com-

School workshops.

prehends the value of a particular material, that he learns the manner in which and the conditions under which it can be best worked. On the contrary, the young man in a small school workshop is at no pains to be industrious and never acquires any great degree of skill.

The house of
rescue of the
Abbé Halluin
at Arras.

At Arras, under the direction of the Abbé Halluin, and by the same Mission of St. Vincent-de-Paul, an orphanage for 200 apprentices has been established. In this house the apprentices at work during the day in different workshops of the town receive board and lodging. The proceeds of their labour go towards defraying the expenses of their maintenance, and the rest is made up by voluntary contributions and by grants from the commune and the department. It is in fact a charitable institution; the inmates have regular hours for meals and for sleep as in a boarding school; in other words it is an asylum for apprentices.

Measures
proposed by
M. Maignen
for improving
the condition
of apprentices.

In conclusion, M. Maignen suggests one or two measures for the improvement of the condition of apprenticeship. He says,—

“I must give utterance to my wish that the excellent institution of giving prizes for apprenticeship in the schools should be extended. This is an admirable institution, that you doubtless know; it consists in a competition established between all the schools, and the city of Paris grants 250 francs to those children who have obtained the first places. It is a great encouragement to teaching in the schools. Unhappily the instruction given in the schools is very deficient; there are eight or ten children who are advanced, the others are neglected. What happens? When the children show any talents their parents, through ambition, will not make workmen of them; they urge them to employment in offices or in commerce, so that there are hardly any children in the workshops but those who know, so to say, nothing. The prizes of apprenticeships are then a very great motive for instruction in schools, and if they could be multiplied it would be a great boon.

“There is another means of encouragement for apprentices; it is exhibitions of their works, followed by rewards. There is much to be said regarding apprentices in workshops. In general the professional instruction of apprentices is very much restricted, is indeed almost null. An apprentice in a workshop is a kind of errand boy; he looks at the others work, and that is all. The name by which an apprentice is called in workshops is that of knowledge catcher (*attrape science*), and it is true; he must catch it, no one shows it him.

“The perfection of the processes of fabrication of mechanical means, make trades disappear, therefore there are hardly any individual trades; there are only *filers*, *piercers*, *turners*. The apprentice is surrounded by workmen who scarcely know their trade. In a word, the artizan is disappearing, the handicraftsman no longer exists; he is replaced by those trades which do every-

thing. For example, the embosser will emboss for the manufacturer of brass ornaments, as well as for the silversmith, and the latter will only have solderers in his workshop to fit the pieces already made. What can a child learn in such workshops as these?

"I have one more improvement to propose, and it is the last: it is to endeavour to help the workmen to keep their children at home during their apprenticeship. I assure you that one of the causes of the decay of work and of the small number of true workmen, is the growing immorality of the workshops. The moral workman is generally clever. That which is true of the grown man is still more so of the child. That which most usually ruins the apprentice is his living at the workshop far from his family.

"Keeping an apprentice at home is almost an infallible means of making him well conducted. But poverty is often the great obstacle which prevents parents from feeding and lodging their children. There is hardly any remedy to this evil, unless it is an ancient institution which formerly existed in the *bureau de bienfaisance*, and which was called *pain d'apprentissage*. Bread was granted to parents to help them to support their children. I repeat, it is greatly to be desired that this institution should be revived. The decay of manual labour has no other cause than the immorality of the workshop. The parents will take care of the morality of the child and of the young man, as well as of his future."

Evidence of M. De Commynes de Marsilly, President, and of M. S. Ferguson (junior), Vice-President of the Industrial Society of Amiens.

This society was established in December 1861 by the exertions of 14 or 15 individuals, with the object of diffusing information among the industrial classes, and particularly that kind of information which bears upon the different industries of the district. It contains now (1864) 300 members, and enjoys a revenue of from 16,000 to 18,000 francs, raised entirely by voluntary subscription. With these resources it is evident that the society could not maintain a regular technical school; the utmost they could hope to effect was to establish public courses of lectures brought within the reach of all.

Objects of the society.

Since the manufacture of cotton, woollen, linen, and mixed fabrics, and of hosiery, is the staple industry of the department of which Amiens is the chief town, the first course to be established was one in spinning and weaving, and accordingly an appeal for assistance was made to the manufacturers of the district most likely to be benefited by the instruction given to the working classes. The success of this appeal was such that in the short space of a twelvemonth, without the aid of a single centime from the State, the society opened

Establishment of courses of instruction in the industries of the district.

its first course for practical instruction in spinning and weaving with a material of the value of nearly 30,000 francs; this material consists of a steam engine of four-horse power and a number of power and hand looms of the most approved and newest construction. These looms were many of them constructed and fitted by mechanics and foremen who gave up a portion of their overtime, some even without accepting payment, for the purpose. By this means the professor of the course does not teach by aid of models, but actually sets his pupils at work on the machines themselves such as are used in the manufacture of the different fabrics. A great advantage which it is hoped will be derived from this course, is the introduction into the manufactures of the district of the more extensive use of steam power, which, especially in the cotton-velvet industry, has been opposed not only by the operatives but even by the manufacturers themselves.

Dyeing forms another industry of great importance in the Department of the Somme, but it is found that many of the workmen and even of the foremen were ignorant of the principles on which their manufacture rests; they know by heart the receipts, the quantities, the processes which they are in the habit of employing, but they can give no cause and find no remedy when the shades of colour are not exact, or when the tints are not perfect. To establish a course of chemistry applied to dyeing was therefore the next step in the path of the society. For this purpose the same means were adopted as in the former case; an appeal was made to the chemists, the dyers, and the dye-stuff merchants, and in less than a month the society was able to establish a very complete laboratory. The course opened in this institution is attended by above 100 students, among whom are many foremen and operatives.

Professors
and teachers.

The professor of the course of spinning and weaving is M. E. Gand, Member of the Academy of Amiens, and one of the original founders of the society. He has also been manager of the society, and receives, in addition to a house, fire, and lighting, a salary of 2,000 francs; besides which he is at liberty to follow his profession of industrial designer and reader of cards for the Jacquard loom. The course of dyeing is under the charge of M. Poiré, a member of the society, and professor at the university. There is also a course of mechanics and mechanism professed by M. Banderali, who gives one lecture a week, but it is less numerously attended than the other two courses. It is also proposed to give a course of instruction in industrial drawing. Many of the pupils when they leave the commercial schools can copy drawings either linear or free-hand, but they know nothing

of drawing applied to industry. The object of this course will be to teach the pupils as they leave the commercial schools the laws of composition and of colour, and when they are intended to enter any particular branch of manufacture to teach them the drawing applicable to that manufacture.

For the benefit of persons engaged in commerce the society has established a class in the English language under the care of M. Leullier. As the commercial relations of this district with England are very extensive this class has been for some time attended by no less than 150 students. The lessons are given twice a week and are quite free. Another member of the society, M. Vion, headmaster at Amiens, has opened a class in German on the same terms as that in English, but it is less numerously attended, as the former language is not of such use to the merchants of Amiens as the latter.

Modern languages.

As a complement to this system of industrial instruction, there is a project on foot to found an industrial museum. The society possesses in the premises which it now rents a large hall which it is proposed to devote to this object. It is first intended to appeal to all the manufacturers of the district for specimens of all the products of the department. It is desired to obtain if not the masterpieces of ancient and modern art themselves, at least copies of them, and for this object the society hopes to obtain the aid of the town and of the State.

Technological museum.

Another purpose of the society is the training of skilled and intelligent foremen. At present it is difficult to find competent foremen, and manufacturers are compelled to bring them from Rouen, Armentières, or England; more often from the latter country. The society therefore proposes to select the most capable from among the operatives and train them to become efficient foremen, so that when a manufacturer stands in need of one he has merely to apply to the society, who will give him ample information on the ability and character of men on whom he can rely.

Training foremen.

There is, again, a project on the part of the society of establishing an apprentice-workshop. The intention is to obtain extensive premises which, as soon as the funds of the society permit, will be fitted with all the appliances both for power and hand weaving. They will then say to the youths: "We are going to give you the opportunity of learning your trade of weaver in a space of five or six months; during this time we will give you 1 franc 25 cents. a day, the same wages as all apprentices get in Amiens. When you leave us to enter a factory we will keep back from your wages the excess above 1 franc 25 cents. If, for example, you

Apprentice-workshops.

“ get 2 francs 25 cents., we shall keep back 1 franc until “ the society has been reimbursed the expenses it has been “ put to for you.” At present however this is only a project in idea.

Advantages of instruction in actual manufacture over that in applied science.

In choosing between scientific and technological courses as methods of instruction, that is, between courses of lectures on chemistry, physics, and mechanics applied to manufacture, and special courses in actual dyeing, spinning, and weaving, M. de Marsilly prefers the latter. He maintains that it is necessary to go at once to the heart of an industry; a student must receive practical lessons in what he practises or ought to practise every day. Thus the attention of the artizan is actively aroused; he is convinced of the utility of what he is learning, and does his best to understand it. He is often stopped, no doubt, by his want of elementary knowledge, but the teacher can supply that by mingling skilfully with his practical instruction information on general subjects. Thus in teaching practical dyeing the professor can recall to his audience or can inculcate such elementary portions of chemistry as may be required; the professor of mechanism in describing steam engines can establish certain general principles of mechanics and physics in the minds of his hearers. Technological instruction is the only one which is adapted to great industrial centres, the only one which is likely to be appreciated and to produce good results; therefore it ought to alter its character and adapt itself to the special industries of the locality where it is given.

Influence of the manufacturers over their workpeople.

To encourage elementary as a preparation for technical education, M. Ferguson would look to the large manufacturers. It is indispensable that all workpeople should be able to read and write, and he believes that the manufacturers can further immensely the action of the Government. One of the means they could employ would be to establish schools in their factories, and compel all their operatives to attend them; another would be to give certain advantages to those artizans who can read and write. For example, some chiefs of industrial establishments provide for their workpeople when they are sick medical advice and medicines; others again have founded bakeries and furnish them with cheap bread. If then all manufacturers were to form analogous institutions they could deprive of the advantages of them such of their workpeople as refused to learn to read or write.

Opinion of Messrs. De Marsilly and Ferguson on the means of extending

In reply to the question as to what should be done to extend technical education in France, these gentlemen made the following statement:—

“ According to our views the aim of industrial education is to enable each member of the working classes to obtain the special

technical knowledge which affects his own industry. We think that such industrial teaching, well understood, well practised, and generalized, may, with the commercial regime that the Government has recently inaugurated, contribute most powerfully to develop industry and cause the country rapidly to rise to a high degree of prosperity. But in what way should this industrial instruction be received? How should it be practised? How make it penetrate to the masses? These are the questions that we have to examine. technical education.

“To solve them it appears to us necessary first to see to what classes this instruction is addressed. For this purpose we divide the industrial classes into four principal categories. The first contains the young men belonging to families in easy circumstances; the second comprehends the youths who are obliged to go to work or into business at the age of 15 years; the third comprises the foremen and the individuals who have received a good elementary education; the fourth consists of the operatives proper.

“Let us examine what there is to be done for the first, those in easy circumstances. These young men have the Central School, and the Schools of Application open to them. We think that under the existing state of things they have in these all that is required. We may even add that it does not appear to us desirable, as regards industry, that too many young men should seek this superior education, which sometimes places them in a difficult situation, diverts their thoughts from commerce and industry, and makes them aspire to places similar to those found under Government. The most important qualification for industry is self-reliance; it is that which contributes especially to the prosperity of a country.

“There are two means of giving the necessary technical knowledge to young men in the second class who have only received superior preparatory instruction. The first consists in creating professional schools in industrial centres of any importance; the second in opening courses of instructions, such as we have already described. There are the Schools of Arts and Trades, which suit a certain number of young men and which render great services; but they are insufficient because they are not numerous enough, or rather because they are only adapted to two or three specialties—mechanism, for instance.

“All the schools should not follow the same programme; that particular trade practised in the locality should be taught in each of them. Thus, at Amiens the instruction should be on all that relates to dyeing, spinning, and weaving, and at Limoges on all that which would be useful in the making of porcelain. This is a first principle with us: we assume that in the professional schools no instruction shall be given but that which bears on the industry of the locality. We also assume that the young men shall not be admitted without having received a superior preparatory education, and that to enter they must undergo examination. We also think that these schools should not take boarders, only day scholars. We are of opinion that the instructors should be appointed by the Government, and the communes ought to support the schools. Private manufacturers, with very few exceptions, do not appear to us able to establish them.

“The second and perhaps the most powerful means of instruction consists in the creation of public and gratuitous industrial classes, because they are adapted to a larger number of persons. We need not enlarge upon the nature of these courses ; we will only repeat what has been said in speaking of our proceedings at Amiens. These classes sufficiently meet the wants of a numerous class of young men whose families will not be separated from them, who desire to continue their father's business, or who are employed in houses of commerce or large manufactures. They can there at the end of their day's work obtain the information which is necessary to them ; they have sufficient elementary knowledge to follow the classes with profit, as we presume that they have already received a tolerably high preparatory instruction.

“We arrive at the third category, that of the foremen ; a class of men which renders the most eminent services, and among whom it is, above all, desirable to diffuse the greatest possible amount of knowledge, because it is upon that knowledge that all the labour of the workshop depends. These foremen are occupied all day ; they therefore require industrial courses of lectures at night, adapted to their requirements, as we have proposed for the second category. It is the only means of augmenting their instruction.

“After them come the artizans. Artizans show a great desire for instruction. Every time the classes have been opened we have noticed that they attend them with much interest and assiduity. In consequence, we think that evening classes might be advantageously established for them, and that they would be well attended. But here we meet with a very great difficulty, that which proceeds from ignorance, which brings us to the question of preparatory instruction. Many of the artizans neither know how to read or write. This is a sad fact, which we often meet with at Amiens. For this reason they cannot follow a course of lectures with profit, for how are they to take notes ? Last year the Industrial Society opened a competition for stokers, to which it invited all the stokers of the Department. The point in question was to heat a boiler as economically as possible, or, in other terms, to produce in the same space of time the greatest amount of steam with a given quantity of coals. Thirty-two stokers presented themselves. We made them undergo a few preliminary trials, which set aside those who were quite incapable. Amongst these trials there was an exercise of reading and writing ; out of the 32 competitors only seven knew how to do either. Nevertheless the stokers form a tolerably intelligent class of workmen ; they are not simple labourers ; they are not chosen from the first who offer themselves. On the other hand, those who presented themselves were certainly not the worst, for to have done so they must have felt that they possessed a certain amount of capacity. Seven out of 32 in a department which is certainly not the least enlightened of France ; this is the proportion.

“In Germany preparatory instruction is compulsory. The results of this are excellent. We have often seen very intelligent work-

men in Germany, and we have heard chiefs of workshops who had occasion to employ simultaneously both French, Belgians, and German workmen, declare that after a certain time they recognized great superiority in the Germans, who were better instructed. Must we endeavour to render elementary instruction compulsory? This is a question we put without pretending to solve it here. That which we state with grief is the very great ignorance and often the complete absence of elementary instruction amongst workmen. It is then expedient, on the one hand, that the Government should do all that lays in its power to diffuse elementary instruction as much as possible, and on the other hand that manufacturers and philanthropists should make the strongest efforts to enable the workmen to take advantage of it. Consequently, we think that, besides the courses of lectures, it would be very expedient to have evening classes for the elementary instruction of artizans. There are already several of these classes at Amiens. We hope to open some ourselves. We cannot certainly do everything at once, but it is a question on which our attention is very seriously fixed.

“A measure which we also think is well calculated to diffuse preparatory instruction amongst artizans consists in creating apprentice societies (*œuvre des apprentis*), the aim of which is to establish a kind of patronage for young workmen, to assist them in their apprenticeship, and to induce them to give up two or three hours every day to study.

“Such are the measures which appear to us best adapted to diffuse a knowledge of technical science among the different classes which compose the great industrial family. The ways and means still remain to be considered, and on this very important point we venture to make a few remarks. We think that professional schools ought to be instituted by the State; it alone can ensure that regularity and order necessary to their stability. But it appears to us very important that Government, in creating these schools, either alone or with the aid of the communes, should seek the support of the manufacturers of the country in the following manner:—By instituting for each of these schools a Council of Improvement (*Conseil de Perfectionnement*), or Superior Council, which should watch over the studies and should be consulted, not only respecting the programmes, but also on the choice of the teachers. We are convinced that by this means Government would everywhere find the most effectual co-operation; it would interest the towns and the men of the various localities in the success of these schools, and it would receive from them most useful information upon all those subjects connected with the local industries. It is quite otherwise in regard to the courses of lectures on technical subjects. We think that here it is the interest of the Government to interfere as little as possible.

“In all these matters it were better that Government should not interfere at all. Though we have asked for its direct intervention just now in the creation of professional schools, it was because we thought it indispensable; but if we could do without it, it appears to us that it would be preferable. The courses of lectures would

succeed as a private enterprise. We ask that Government should only intervene by encouragement and grants, if necessary. Respecting what we are doing at Amiens, for instance, we think that the intervention of Government ought to be limited to moral support ; we only ask the continuation of what has been done for us up to now by the Prefect of the Somme. If at any time our resources become insufficient, then alone we would apply to Government for a grant, but we wish to act as much as possible on our own resources, and we think that it is the best plan.

“In all cases we think that Government should stimulate private and local enterprise. Where no industrial society exists it might apply to the Chambers of Commerce, and ask them to point out what courses of lectures they thought it would be best to establish. It might put a certain sum at their disposal for this purpose, and thus induce them to establish these courses. But in such a case we assume that the Government will confine itself to granting pecuniary aid, and to exercising a general supervision ; all initiative it will leave to the Chambers of Commerce and the manufacturers of the place. The professors, for instance, ought to be chosen by the Chambers of Commerce. There is another motive for proceeding thus, besides that of interesting the men of the place in the success of a local work of importance. By giving a grant the Government can very well call upon the Chambers of Commerce and the manufacturers to share in the work ; it can easily say to them: We wish to see industrial classes established in your town ; we are disposed to pay the teachers, but you must procure us the premises and the necessary material, or at least a part of it. On all accounts we attach great importance to the development of local and private action under an appeal from the Government.”

Evidence of M. Lequien (senior), Director of the Communal School of Drawing in the Rue Ménilmontant, Paris.

Communal
schools for
drawing in
Paris.

There are at the present day seven communal drawing schools maintained by grants from the Municipality of Paris. They are intended entirely for the benefit of the artizans who pursue trades depending on the arts of drawing and sculpture, as the trades of the upholsterer, the paper stainer, the porcelain manufacturer, the bronze worker, the jeweller, the goldsmith, the engraver, the designer of tapestry and carpets, the sculptor, and the decorator. Hitherto the grants to these schools have been inconsiderable ; there is no general organization regulating the nature of the instruction and the method of giving it, but every teacher has pursued his own course on his own responsibility. It is true the teacher has been actuated by conscientious motives, but he is under no control ; the consequence is that the future of each school is dependent on the circumstances which affect its director. Notwithstanding, however, that these schools of drawing are

thus abandoned to themselves, they can claim to be the cause of nearly all the progress which has been accomplished in the manufactures above enumerated.

The aid granted to the school of which M. Lequien is the director consists of an annual grant of 3,000 francs, with the cost of lighting. The number of students registered on the books is on an average 200, but these do not attend at all regularly. It cannot be reckoned that any one student attends the school more than six months in the year. The age of the students varies from 12 to 30 years; taking the mean it may be called 16 years. They pay a monthly fee of 3 francs. Students presenting themselves with a certificate from the mayor of their arrondissement or from a charitable society (*bureau de bienfaisance*), or even with a recommendation from one of the apprentice societies (*sociétés de patronage*), receive a free admission, but it must be confessed that these free students are among the least industrious attendants at the school. Since the year (1835) of the opening of the school to the year 1853, 7,000 pupils have passed through it, giving an average of 250 attendants for every year.

Statistics of
the school in
the Rue
Ménilmontant.

It is an object with M. Lequien to render the instruction in drawing in his school as general as possible under its two great divisions, that of the figure and of ornament. As there are many specialities in manufacture, so each pupil wishes to learn some special branch of drawing or some peculiar style, but it is found that a general course of instruction renders the workman capable of pursuing any branch of his art. But though the instruction is general in principle that does not prevent the pupils from studying the portions of the subject bearing more directly on the manufacture at which he works: studies which, however important in other respects, are completely out of the way of the object which he wishes to attain are not forced upon him. Besides it is necessary to give way in some degree to the expressed wish of parents or masters when they themselves present their children or their apprentices at the school.

Course of
instruction
very general.

A special studio for modelling has been established.

In reply to a question M. Lequien advocates strongly the introduction of linear and architectural drawing into these schools. On this point he says:—

Views of M.
Lequien on
teaching linear
drawing.

“I believe instruction in these subjects to be indispensable to all engaged in the manufacture of furniture. Cabinet making particularly would derive great benefit, both as regards the proportions, elegance, and purity of form, as well as regards the harmony of the mouldings, which are often disproportionate or of different styles. A piece of furniture, no matter what it may be, whether a cabinet, sideboard, bed, or console, is nothing but an

edifice applied to a useful purpose ; architectural design should rule the whole as well as the details, and it is from the judicious combinations of these elements arranged with a view to its use that it derives its merit. Furniture destined for repose ought to be of simple construction ; the ornaments with which it is often overloaded appear to be made rather to hide the clumsiness of its form than to embellish it. Ought not the furniture of a room to agree both in shape and colour with the architecture. It is a whole, each part of which should be in harmony. In this last part of the work the architect is often replaced by the paper-hanger, who having no architectural or decorative knowledge allows himself to be guided by the extravagant caprices of fashion or by a traditional routine. Again, bronzes, lustres, candelabras, cups, and the basement of a clock may all be considered in relation to their architectural fitness. Ceramic art borrows its first and principal value from form. No matter how great the merit of the paintings which ornament porcelain, it is the proportion and the elegance of the shape which ought to be the first consideration. In monumental art, statuary itself is subordinate in its proportions and its effect to the laws of the science of lines which ought to prevail in every manufacture."

Linear drawing to be taught to girls.

M. Lequien also recommends the adoption of elementary linear drawing as a subject of instruction in the education of girls ; provided that it does not go further than the description and definition of the principal geometrical figures. He asks, Why should a woman not know what is an angle, its relative value, and the means of discovering it by means of the protractor ? Why should she be ignorant of the use of the compass and the square ? Why should she not be able to describe a circle and to measure the number of degrees in its circumference ?

Theoretical study applied to industrial art.

According to M. Lequien a great decline has taken place in the theoretical studies bearing on the industrial arts since the year 1848. There are several causes for this decline, but the most important is the modern condition of apprenticeship. On this point he enlarges at some length, and points out the dangers to which an apprentice is nowadays exposed in the workshop. Where one or two apprentices are quite enough to have in the shop to be able to teach them their trade properly, it is now not at all unusual to see 10 ; they are instructed in a few months in one of the divisions into which their trade is subdivided, and in less than a year are in a position to earn wages of one or even two francs a day. This branch of the trade they carry on for two years or sometimes for more, and when the limit of their indentures approaches they are made to undertake some more important work which they do not understand for want of being prepared for it. The hours which they pass in the workshop from 6 o'clock in the morning to 8 o'clock at night, and

which are often extended to 9 and even 10 at night in the hope of gaining a few extra sous, preclude them entirely from attending any school for apprentices. It may be affirmed that the more an apprentice earns the less he learns.

In consequence of this defect, as well as the immoral tone of the workshops, M. Lequien considers that parents of the middle class hesitate now before apprenticing their children to an industrial trade. At the expense of even privation and suffering they will make sacrifices to keep the children longer at school, and as soon as possible obtain employment for them in houses of business or the offices of the large companies. Thus it comes to pass that the industrial arts are forsaken by the very social class which could benefit by them, whose progress and morality they would promote.

Evidence of M. Bernot, Director of the School of Industrial Arts and Mines at Lille.

This school, established in the year 1855 under the title of the Professional School (*Ecole professionnelle*) of Lille, was at first anything but a success, and struggled on against adverse circumstances until the year 1860, when under new management, a change of programme, and an altered title it made a more successful appeal for public support. Founded at first as an institution for the training of foremen and skilled workmen, it had to compete with the Superior Primary School (*Ecole primaire supérieure*) of the town, an institution where an education of a more general character was successfully given, besides which it received no pecuniary assistance either from the town or the department. In its present form the pupils of the school are the sons of manufacturers, who pay as boarders the annual sum of 1,000 francs, and the municipal council further aids the school by the establishment of scholarships.

Varying success of the school.

The school is open to young men who after having passed through the classes of the lycées and similar institutions, wish to receive special instruction in one of the following industries:—1st, the construction of machines; 2nd, weaving and spinning; 3rd, applied and agricultural chemistry; 4th, mining. The studies are analogous to those of the Schools of Arts and Trades, and of the Central School, but while it is more practical than that in the latter, it is at the same time more special in its applications, more limited as regards the time devoted to manual labour than in the Schools of Arts and Trades. Every day the pupils pass from two to three hours in the workshops for forging, founding, fitting, joining, and modeling, at the looms or in the laboratory, and as often as possible

Objects of the school.

they are taken by the professors to visit the larger manufactories of the district. The duration of the course of study is two years, followed by a complementary year for those who take the course of mining, or who wish to obtain a more complete knowledge of construction. A diploma certifying ability in one of the special subjects of instruction in the school is given after examination before a board.

Conditions of admission.

To be admitted to the industrial courses it is required that the candidate should be 16 years old, and should pass an examination in the subjects of examination for the bachelorship of science, but for graduates this examination is dispensed with. The terms for a boarder are 1,000 francs, for a half-boarder 750 francs, and for a day pupil 500 francs. Out of doors the pupils wear a uniform and a special dress in the workshop. The school also takes day scholars, paying only 100 francs a year, and receiving instruction to fit them for foremen, which consists of machine drawing and mechanism, demonstrations in the laboratory, and working in the shops. An evening course of weekly gratuitous lectures for stokers has been established, and the possibility of giving practical courses to workmen is under consideration.

Course of instruction.

In the first year the students are instructed in physics and chemistry with their applications to manufactures, algebra, descriptive geometry, analytical geometry, and a little of the differential calculus, with its application to mechanics. Drawing is taught after the method adopted in the Schools of Arts and Trades; in every case a free-hand sketch in a book precedes the working drawing. The course of machine drawing proceeds regularly from preparatory exercises to parts of machines, and finally to finished drawings of the machine itself; the pupils prepare both drawings of machines, of which the data are given in the course on mechanism, as well as working drawings from sketches made in the workshop of machines erected there or under repair. The general principles of mechanics are studied as preparation to the course of mechanism and the construction of machines.

In the second year the pupils while studying in common commercial accounts, the management of factories and industrial economy, applied physics and chemistry, the sanitary arrangement and architectural construction of workshops, are divided into sections for the special subjects. In the first division are taught the construction of machines, with the means of supplying materials and learning their nature and commercial value, the method of working them up, and of forming rough estimates of their cost. The pupils of the second division study, not only the working of textile fabrics, but also the industrial and commercial organization of weaving

and spinning workshops, both as regards working staff and materials. In the chemical division instruction is given in the industries of bleaching and dyeing, in the manufacture of chemical products, beer, oils, manures, sugar, alcohols, alkalies, gas, and their derived products. The mining division includes pupils in geology and mineralogy. The complementary studies of the third year comprehend the working of mines, metallurgy, and stereotomy, and an extra course in the fitting of machines.

The training given in the workshops is intended to accustom the pupils to the working of machines and looms, to give them manual skill, a practical acquaintance with the processes of execution, a knowledge of the difficulties which the raw material opposes to mechanical action, and finally to fit them specially for undertaking the charge of workshops and the direction of workmen. By this means the works executed excite their emulation and the action of the machines becomes familiar to them, the whole forming a technical and experimental system of instruction which could be replaced by no other. Manual labour.

The school numbers now nearly 60 pupils, for whose instruction there are employed a head professor, three assistant professors, an usher, and a director of the workshops. When the school was established on a new basis the aid received from the town and department amounted to 10,000 francs, this sum has decreased in successive years to 8,445, 8,164, and 5,521 francs, and will still continue to diminish as the school develops its resources. The works executed in the workshops are farmed by a contractor; the advantage of this plan is that it enables the director to supply his pupils with a great variety of works without having to draw specially on the funds of the establishment. Thus in two years the pupils of the school have repaired and altered 12 spinning frames, constructed boring apparatus, and forged mining tools; repaired two steam engines, made 100 centrifugal and common pumps, executed numerous works in joining and modelling, and completed distilling and sugar apparatus. Statistics of the school.

In reply to the question as to what are the wants, and what should be done to meet them, of industrial education in the Department du Nord, M. Bernot divides the constituency whose case is to be taken into consideration into three categories; 1, the workmen; 2, the foremen; 3, the large manufacturers. In the first case he is of opinion that the great obstacle to the development of technical training lies in the want of elementary instruction; with this instruction properly extended, supplemented by the teaching of industrial drawing, Views of M. Bernot on technical education in the Department du Nord.

artizans would be quite in a position to appreciate the value of the practical education they receive in the manufactory. To give increased facilities for acquiring a knowledge of drawing, M. Bernot would found apprentice schools and establish evening classes. With regard to the foremen it would appear that the teaching hitherto offered to them has been of two abstruse and scientific a character, a defect which might be remedied by the establishment of night classes and the appointment as teachers of persons selected from among the employés of the great manufacturing houses, who would inspire confidence in their pupils as being of the same class as themselves. As respects the manufacturer, M. Bernot considers that in the Department du Nord, he has been too long a mere merchant, without sufficient scientific knowledge to recognize and apply new discoveries to his industry. This defect is just the one which the School of Arts and Mines at Lille has been established to meet.

Recommendations for the extension of technical education.

In conclusion M. Bernot makes the following recommendations:—1st, the foundation of an institution on a large scale for the special instruction of all engaged in industrial manufactures in the Department du Nord, and maintained by grants from the State, the town, and the department; 2nd, municipal courses of lectures in every town to complete the education of foremen according to the special industry of the locality; 3rd, the formation of night classes in still greater numbers where the elementary instruction which is so much needed by the operatives is supplemented by the teaching of industrial drawing.

Evidence of M. Noyon, Director of the Municipal Affairs of the City of Paris.

Action of the municipality of the city of Paris.

The city of Paris maintains 110 primary boys' schools, 109 girls' schools, 48 classes for male adults, and 19 classes for female adults; these schools and classes are entirely free. It aids besides 10 private schools for boys and seven for girls, and seven male and eight female schools of drawing. It also possesses the Chaptal College, the Turgot School, and the female school in the Passage St. Pierre; these are institutions for secondary instruction.

Primary and drawing schools.

In the primary schools the principal subjects taught are reading, writing, spelling, and arithmetic, and in addition, in the first class, the elements of French history, and of geography, singing, and (in the boys' schools) drawing. The latter subject is not taught in the girls' schools. The adult schools or evening classes are conducted in the rooms of the primary schools. Parallel with these adult schools there

have been established 15 special schools of drawing, seven for men and eight for women, and comprising the Imperial School in the Rue de l'École-de-Médecine; of these the men's schools have been several years in existence, but the women's schools have only been founded within the last few years. Projects are entertained of increasing the number of all these schools. The Prefect of the Seine intends to establish both a male and a female school of drawing in every arrondissement of Paris. It is also proposed to found two new Turgot schools, and another Chaptal college. The total cost to the city of Paris for the maintenance and aid of all these schools and classes amounts to five millions and a half of francs. In the primary communal schools there are under instruction 29,629 boys and 24,931 girls, and in the adult classes 7,100 men and 1,500 women. The drawing schools which are aided by the city have inscribed on their registers 1,607 boys and 427 girls, with an average attendance in each case of 907 and 200. The Imperial drawing school (*École Impériale de Dessin*), which adopts a special system of instruction, is included in these numbers; in this school drawing is taught in all its degrees, from linear drawing up to drawing from the cast, and art drawing. A course of construction, of course not so extended as that professed at the School of Bridges and Roads (*École des Ponts et Chaussées*) and the Fine Art School (*École des Beaux Arts*); a course of architecture and another of chemistry are also taken here. Drawing is not only taught in all its applications to the industrial arts, but designs are also made for bronzes and furniture, thus giving the school a truly professional character.

There is no regular apprentice school maintained by the city, but it has made advances in that direction by the establishment of exhibitions for apprentices, and has placed on its estimates the sum of 81,475 francs for several years with this view. In this way the municipality aids annually in the apprenticing of about 900 children on their leaving the primary schools. Every year a board, presided over by the mayor or his deputy, and composed of the curé of the parish, a minister not of the Roman Catholic communion, a member of the committee of the canton, an inspector of primary schools of the arrondissement, and a lady inspector of girls' schools, makes a list of six candidates for every hundred children in the school upon information furnished by the master or the mistress, and after a preliminary inquiry as to the condition of the parents. To be admitted to this list the children must belong to poor parents, who engage that that they shall learn some manual trade, and who are them-

Exhibitions
for apprentices.

selves distinguished for their industry and good conduct. The children must, besides, have attended the communal schools for at least two years; they must have been confirmed, or be more than 12 and less than 14 years old. When thus admitted to the list they have to undergo an examination before the board in their respective schools in those subjects which are compulsory in primary education. The results of the inquiry into each case, the lists of the candidates, and the notes of the examination are submitted to the Municipal Council, who propose for the selection of the Prefect two candidates at least for each exhibition, and he nominates the exhibitioners. When the nominations are settled, the municipal bodies put themselves into communication with the masters, and the respective obligations of the masters and of the parents or guardians are fixed by indenture. The mayor of the arrondissement is also a party to the indenture, and is able often to obtain wages for the apprentice. In this case the exhibition or the sum left out of it is deposited in the savings bank for the benefit of the apprentice. But he is not lost sight of by the authorities; at the expiration of his apprenticeship the committee of the canton gives information as to his conduct, and according to their report the sum deposited in the savings bank is handed over to the apprentice when he is of age, or restored to the municipal treasury.

Opinion of M. Noyon on the extension and development of technical instruction.

In reply to a question demanding his opinion as to what should be done to extend and develop professional instruction, M. Noyon considers that the schools of the character of those of arts and trades at Aix and Châlons should be multiplied, and that important towns should be induced to establish institutions on the principle of the Turgot school. He also recommends a more extended course in the drawing schools, and especially the introduction of modelling.

Evidence of M. Thunot, President of the Conseil des Prud'hommes, at Paris.

Intervention of the Conseil des Prud'hommes in cases of dispute between master and apprentice.

The action of the Conseil des Prud'hommes in regard to apprentices appears to be limited to the settling of disputes on the proper carrying out of the indentures of apprenticeship, and in such cases the only means they can adopt is that of arbitration or conciliation. For instance, in case a master ill-treats an apprentice the Prud'hommes have no power to punish him by fine or otherwise, and when parents insist on withdrawing their children from their apprenticeship before the expiry of its term, the Prud'hommes can estimate the damages which have accrued to the master, but are without the power of enforcing the payment of them.

In nearly all the cases of dispute the appeal to the Council is from the side of the parents, and the charges against the master are those of either ill-treatment, insufficient feeding, or overwork. The two former of these accusations are generally discovered to be ill-founded, and to proceed either from the desire of the parents to withdraw their children from their apprenticeship, and thus enable them to earn as journeymen higher wages than they are capable of doing as apprentices, or from the idleness and intractability of the children themselves. The charge of overwork is, however, often a true one; not unfrequently in some trades children are kept at work from 6 o'clock in the morning to 9 or even 10 at night; in others, under a pressure of work, they are compelled to work during a part and sometimes the whole of Sunday. Of course these hours are illegal, but the law regulating the labour of apprentices seems to have fallen into desuetude, and the system of inspection is singularly ineffective. The Prud'hommes can only interfere when a complaint is lodged before them, so that they are powerless to see to the execution of the law.

Complaints against master generally not founded in truth.

M. Thunot remarks that it is rare that disputes are submitted to the Council as to the execution of indentures of apprenticeship entered into under the auspices of the religious and charitable societies for encouraging and aiding apprentices. This may be owing to the care which these societies exercise in superintending and overlooking the conduct of their wards. As in any case of disagreement the parties have to appear before the Council to state their own case in person, it would be difficult to make one of these societies a party to the dispute, though any evidence they may wish to give by letter on the subject or cause of the disagreement would be admitted.

Complaints rarely lodged by apprentices under the patronage of religious or charitable societies.

Evidence of M. Bader, Director of the Professional School at Mulhouse.

This school was established by the city of Mulhouse for the professional instruction of the children of manufacturers and of persons in easy circumstances, and preparing them for an industrial career. At eight years of age they are admitted, and can, if they please, remain until their eighteenth year; but in practice it is found that a large majority leave before they attain that age, either to go to other schools or to enter business. The vacancies thus created are, however, soon filled up by others entering, so that the school maintains its average number. The course of education commences with six years of perfectly general instruction, about equiva-

General account and objects of the school.

lent to that given in the Lycées and other secondary schools, except that the dead languages are replaced by those of England and Germany. At the seventh year of their studies the pupils—then at the age of fourteen years—are divided into two divisions. The first consists of those who are only to remain at school for two years more, and are then to enter mercantile houses or the professions, and require no special technical instruction; these receive an instruction rather general than applied. The pupils of the other division remain at school for another four years, or to their eighteenth year, and receive an instruction partly general, the subjects of which are literature, history, mathematics, the physical and mechanical sciences, and drawing; partly special, which is divided into courses on the construction of machines, the textile fabrics, and the chemical arts. Besides this, there are workshops which the pupils of the second division attend for two hours every day. As soon as a pupil enters the school he commences the study of modern languages, which he learns to speak rapidly; and as regards geometrical and machine drawing, he is no longer allowed to copy as soon as he knows the use of his pencil. One of the great advantages of the system is that the pupil grows up in what may be called an industrial atmosphere, in the midst of machines and workshops. Far from having a foolish contempt of manual labour, he learns to hold it in esteem. He applauds his comrades who excel in that branch as much as if they had carried off the prize for literature or mathematics, and above all, he learns at an early age to make use of his ten fingers. The system has, however, also its inconveniences; the children get tired of remaining ten years at the same school, and the parents get tired of sending them. Thus it happens that the number of pupils in the last year but one scarcely amounts to 20, and in the last year to 10, and among these very few have commenced their studies at the school. For this reason, also, the pupils, who on an average number 300, are not divided equally among the 10 years; but lately this total has been decreased by the effects of the cotton crisis, the cotton manufacture, printing, and dying being the staple trade of Mulhouse and the district.

Financial condition of the school, and social position of the pupils.

The terms of the school are 700 francs yearly for boarders, besides the cost of the schooling proper, which varies according to the division that the pupil attends or the special studies he may adopt. The school fee in the first three classes is 90 francs, then it rises to 120 francs in the intermediate classes, and finally to 200 francs in the higher; besides this, a fee of 200 francs is charged for attendance at the chemical laboratory, the mechanical workshop, or the weaving school.

From the city of Mulhouse is received an annual grant of 6000 francs. The governing body consists of the principal manufacturers of the city, chosen by the Minister of Public Instruction. As regards the social position of the pupils, they appear to be the sons of manufacturers, or managers of large works, and of professional men and Government employés. Of course the day pupils are inhabitants of the city, while the boarders come principally from the Department of the Haut-Rhin; besides which, the school is attended by about 20 foreigners from Switzerland, Germany, Holland, Russia, Italy, and Spain. The pupils belonging to families residing in the district obtain employment on leaving school either in their fathers' houses or in those of firms connected with them by ties of business and friendship. Many of them who are in need of it are enabled at once to gain their own livelihood, obtaining appointments as assistants of the managers of machine workshops and cotton mills, while it has happened that some who have received a training in the school workshops have on leaving obtained employment at wages varying from 2 to 4 francs a day as fitters and forgers.

The practical training of the school is divided into three divisions. The first is given in the machine workshop, the second in the laboratory, the third in the weaving school; which latter, however, is distinct from the Professional School. There is also a carpenter's workshop, in which a sort of preparatory training is given to the pupils of 12 and 13 years old, the object of which is not to turn out carpenters or joiners, but to give the pupils a taste for manual labour, and to form the hand and the eye; it may almost be considered in the light of an athletic exercise. The students attend in this shop only one hour three times a week, and are practised in planing, in making small articles of cabinet work, and at the lathe. Manual labour.

The machine workshop includes fitting, metal turning, forging, and mounting machines. The machine tools, which, as well as the four-horse power steam-engine, have all been made by the pupils, comprise forty fitting vices, three gearing lathes, a screw-cutting lathe, a drilling machine, and a small planing machine. This workshop is attended by the pupils for four years two hours a day. They commence by learning to file and finish a piece of iron, then to make a square and other small tools. When they have acquired a certain amount of skill they are employed in the making and fitting of machines and tools used in the workshop itself. At the present time (1864) they are engaged on a large machine for planing iron. When the workshop is completely supplied with tools it is The machine workshop.

intended that the pupils should construct a collection of small models to serve as illustrations at the lectures. Already they have made a small steam-engine, which can be taken to pieces on the lecture table. The staff of the shop consists of an engineer, who has the chief direction, and who is at the same time professor of mechanics in the school; of a foreman, who instructs in fitting and mounting, the use of the lathe, and the forge; thirdly of a stoker, under whose direction the pupils in turn learn to heat the boiler and to drive the engine; lastly, of a permanent apprentice, who, while learning his trade, is charged with the care of the tools and with keeping the shop tidy. All the expenses of this shop, including wages and fuel for the forge and for the engine, but not including the salary of the engineer-director, who is paid as professor of the school, amount to 600 francs a year. It may be noticed that these two hours of manual labour five days in the week do not prevent the students from acquiring as much knowledge of mathematics, physical sciences, &c., as they would obtain in the Lycées, class for class. This labour is rather a rest for the mind; to the extent it is carried on in the school it by no means hinders the pupil's progress in more serious studies. One of the features of the general scheme of instruction of the pupils in the mechanical arts, is that the training in manual labour and in drawing serve as an important aid to the courses of lectures in kinematics, on the steam-engine, and in the technology of railways. The same pupils must attend the course of spinning, which is rather one on the construction of the spinning machine than on the process of manufacture. The same professor being charged with instruction in machine drawing and mechanics, and with the direction of the workshop, it is easy to see how these three subjects are worked together and assist one another.

Chemical
laboratory.

Pupils who are intended for the industries dependent on chemistry are admitted for two hours every day to the chemical laboratory. In addition to the general instruction in chemistry which they get there, there is a special course of analysis and another of printing and dying. Besides the chemical pupils who follow the general course of study, those who have already completed their schooling and wish to learn nothing but chemistry, can pass their whole time at the laboratory and complete their studies in one or two years, according to the amount of chemical knowledge they possessed on entering. For instruction in the chemical industries of printing and dying the school has obtained the co-operation of one of the most important houses in Mulhouse, that of Dollfus-Mieg, which permits the students, under the charge of their pro-

fessor, to pay periodical visits to their manufactory, when the chemists and employés of the establishment give themselves considerable trouble that the students may see and understand the different processes of manufacture. The laboratory of the school includes a large room for manipulations, or the laboratory proper, a room for analysis, a vestibule (containing steam and water baths, an assay furnace, a copper still, a printing table, and an indigo tub), a small laboratory for the professor, where are kept the balances and delicate instruments, and a shed in the open air for manipulations which cannot be carried on in the laboratory. It is the intention of the managers to add a hall for keeping specimens, a small cabinet for quantitative analysis, and a large room for calico printing, which is to be furnished with (besides the tools used in hand printing) a roll machine for teaching the process of printing by power. Recently important alterations and improvements have been made in the laboratories, in consequence of a visit of M. Schützenberger, the professor of chemistry at the Polytechnic of Zürich. The ventilation has been improved, the water-taps increased in number and arranged so as to give the manipulators a constant supply of nearly chemically pure water, and water baths and steam baths have been placed within the reach of each. Very shortly it is hoped to replace the use of charcoal and wood-spirit as a fuel by gas, which up to the present time is not supplied from the gas-works during the daytime.

The staff consists of the professor, his assistant, and an attendant. The cost of material varies according to the number of pupils, but the annual estimate amounts to 2000 francs. In addition, each pupil passing his whole time in the laboratory pays 300 francs for the apparatus and chemicals he uses, every one attending two hours a day 150 francs, and a fee of 20 francs is charged to those students of the mechanical and weaving sections who have obtained permission to attend the laboratory once a week.

Each of the students carries on his work by himself, the beginners being under the direction of the assistant, and the more advanced under that of the professor. The number of pupils learning chemistry as a specialty scarcely amounts to twelve, and about the same number attend for two hours every day. As the former come at eight o'clock in the morning, they are under the immediate superintendence of the professor and his assistant for the first two hours of the day, but for the next two hours they are left more to themselves, while the attention of the teachers is directed to the others. Although the number attending the laboratory is so small, there does not seem to be any reason to expect that it

Method of instruction.

will be or should be greater. It is true the chemical section is organized in such a way that the instruction is of the greatest importance to all intended for manufactures which depend upon chemistry, yet it is given more particularly with reference to the industries of printing, dyeing, and chemical products. The number of chemists employed in these trades is not so great as might be supposed. Manufacturers of chemical products and calico printers do not like to have a large number of apprentices. In every manufacture there are certain particular processes the secret of which the proprietors do not care to divulge, and generally in the Department of the Haut-Rhin, the employment of these processes is restricted to the sons or nephews of the manufacturer. All the large establishments belong in general to several partners; the chemist therefore is one of the family, so that there is only a small opening in this line for young men who have no family connexions with the great houses.

The weaving
school.

The weaving school was founded by the principal manufacturers of the department of the Haut-Rhin, under the patronage of the Industrial Society (*Société Industrielle*) of Alsace, and is entirely distinct from the Professional School, although it is attended by the students of the latter. It admits only day-pupils, and resembles in many respects the weaving schools at Lyons, except that the latter are for instruction in hand weaving, while the one at Mulhouse is fitted with power looms only. Students of the Professional School who are destined to become manufacturers of textile fabrics attend this school for three years, while their comrades of the mechanical and chemical sections take the special courses at their own school. They are at work during the whole day in this establishment under the direction of a professor of weaving. The weaving school was founded three years ago, and is maintained by its founders: its director is appointed by a committee of management. It is well organized and very successful, and is now under the direction of M. Fries, who has been manager of several works both in England and in Germany. The annual fee is 600 francs. As to the position of the pupils, it would be difficult to say that the school addresses itself to any one class of society rather than to any other: there are to be found there the sons of manufacturers as well as of their employés. The instruction is given to each student individually, and consists in teaching him to read a design for figured goods and to place it on the cards. Each student keeps a note book, in which he enters the general rules of weaving and their application to stuffs, from the simple to the most complicated. The course includes also

the preparatory operations, and a knowledge of raw materials, and of the different methods of treating them.

The students of the professional school attend the course of instruction in science and literature at the Upper School of Science and Literature (*Ecole Préparatoire à l'Enseignement supérieur des Sciences et Lettres*), which also was established, and is maintained by the municipality of the city of Mulhouse, and in order to avoid confusion and to utilize all their teaching power, the courses in science and literature at the Professional School (with the exception of a complementary course of mathematics) have been suppressed, and the students of the last two years confine themselves entirely to the technical instruction. Although M. Bader is himself a professor at the upper school he does not approve of this division of labour, and thinks that it leads to bad results.

Superior instruction in science and literature.

With regard to the question of professional education in general, M. Bader is of opinion that all institutions for technical instruction should be established by, and under the direction of, the governing bodies of the towns in which they are founded, provided always that the professors and teachers be selected and appointed by the Minister with public authority. In all cases much latitude should be left to the initiative and action which each town may be inclined to take in the organization and maintenance of such schools. The secondary instruction in the Lycées in France is now organized on such a plan that the pupils could with ease pass at their fourteenth year from the Lycées into technical schools established on the plan of the Professional School at Mulhouse, supposing them to be intended for an industrial career. With the exception of the dead languages, the general instruction given during the first six years at the Professional School resembles in all respects that of the Lycées.

Views of M. Bader on the condition of technical education in France.

But an exaggerated idea is apt to be formed of the desire which manufacturers have to possess employés who have been trained in the technical schools. To make use of a commercial expression, the supply exceeds the demand. It is very usual in the manufactory to look down upon the pupils thus prepared, and to attribute to them (often without reason) excessive pretensions. For inferior employments, as that of foremen, the masters prefer taking young people whom they know, sons of their operatives and employés; no great general knowledge is required of them, it is rather a question of trustworthiness. Technical knowledge they can pick up in the house itself. As far as regards the workmen themselves, the proper method will be to give them the means of instructing themselves outside the shop, rather than to train them in special schools.

Theoretical knowledge not always valued by employers.

Law regulating
the hours of
labour of
children
practically a
dead letter.

Schools in
Württemberg.

Opinion of M.
Bader of what
is necessary
to render
technical
instruction in
France
efficient.

M. Bader joins with all the other witnesses in deprecating the relaxation of the law regulating the hours of labour for children, and in decrying the system of inspection under which it has been allowed to fall into its present state of desuetude. He regards this as the great obstacle to the spread of primary education among the working classes. He would even extend the action of the law further, and make it apply to children above 12 years of age. In this respect M. Bader thinks most highly of the Improvement Schools (*Fortbildung Schulen*) in Württemberg, a system under which the apprentice is passed on from one school to the other. Many little towns have associations of masters who bind themselves to allow their apprentices two hours in the evening for study at these schools. More than that, in the country the teachers are charged to teach not only children but adults the principles of agriculture and arboriculture. For these teachers practical courses are held in the normal schools; they are taught to graft and prune trees in a scientific manner, they are instructed in viniculture, and when they take schools in the villages they have to spread the knowledge they have acquired.

Summing up what he thinks necessary for technical instruction in France, M. Bader says: "I ask for the working classes, properly so-called, schools in or by the side of the workshop. I do not deny that for certain particular industries, where the workman must almost be an artist, apprentice-workshops may be of great value; as, for example, in the clock and watch-making trade. But the more I observe the facts, and the more I study the question, the more it appears to me doubtful whether there would be any advantage in establishing apprentice workshops for mere workmen; for they learn the special craft which they have to practice in the works where they are engaged far better than they could do in the workshop (always slightly artificial) attached to a school."

"On the other hand I take the intellectual culture of the working classes and the diffusion of scientific knowledge among them, as well as the development of industrial and artistic drawing, to be a subject of the highest importance. I desire that the schools attended by the young operatives should receive the highest possible organization, and that the instruction given there should be completed by courses of applied mechanics, physics, chemistry, and natural history, arranged in such a way that they may be attended by the workmen in the evening and during the hours of leisure."

"For young persons who are able to devote a longer time to school before commencing their apprenticeship, I recommend that (according to the resources of the locality) endea-

your should be made to insure the complement of elementary education, that which was formerly called higher primary education (*instruction primaire supérieure*), and which is intended for children of from twelve to fourteen years of age. Secondly, I believe, that for young persons who can remain at school to their sixteenth year, the regulation as to professional study lately promulgated by the minister of public instruction is in the right road; and I can say as much of the Turgot school."

"Lastly, for those who are to form the staff (*état-major*) of our industries, we must certainly have special schools, both industrial, commercial, and agricultural. These schools must be of different degrees of which the types as far as regards manufacturing industry are to be found in the Schools of Art and Trades, in the industrial section of the Professional School at Mulhouse, in the Central School of Arts and Manufactures, and in the School of Mines. Above all, in such schools as these it appears to me to be necessary that apprentice-workshops should be established, for the young men cannot as apprentices attend the workshops of the factories."

Evidence of M. Girardon, founder and director of the Central School at Lyons, Professor at La Martinière School.

At Lyons there are two schools devoted to industrial instruction—La Martinière School and the Central School; the first of these is a free school and is attended by the children of the lower classes; the second is for the children of those in more easy circumstances.

The school of La Martinière was founded thirty years ago, by General Martin, and has since been enriched by a legacy of M. Eynard, one of the governors of the school. It now possesses property of about two millions of francs, of which about a half is represented by the building, furniture, museums, &c. The collection of machines given by M. Eynard, is constantly receiving additions of models made in the workshops of the school. The total revenue of the school is about 120,000 francs. The general management is in the hands of a committee of seven members appointed by the municipal authorities, of which seven, one resigns every year, but is eligible for re-election. A principal, a vice-principal (*censeur*), and superintendents form the administrative staff, while the instruction is carried on under the care of professors, assistant-professors, and masters. The school is entirely gratuitous, not only as regards instruction, but as regards the pupils' appliances of all sorts. Besides this a certain number of rewards of the value of from 60 to 120

General account of La Martinière school.

francs are given to the poorest families, whose children have distinguished themselves by industry and good conduct. The pupils are only admitted between the ages of 12 and 14, and their number is limited to 500.

Social position
of the pupils.

As a rule, the children are the sons of chiefs of workshops, tradesmen, foremen, and artisans in different trades. They are intended to become skilled workmen and foremen, and leave school at an age which permits of their going through a practical apprenticeship in the trades they have selected. Care has been taken to prevent the change of class which would inevitably take place if they were kept at school to a more advanced age, for then they would seek employment as clerks, instead of adopting the handicrafts in which they have a much greater chance of succeeding. The number of children of families in more easy circumstances attending La Martinière is small, but is sure to increase at any time of commercial suffering.

Hours of study
and examina-
tions.

All are day scholars, and the hours of attendance are eight a day, broken by an interval of two hours for meals. Of the eight hours two are devoted to mathematics, physics, and mechanics; two to drawing, one-and-a-half to chemistry and the remaining two to writing, grammar, and the theory of manufacture. The latter course is attended by only a limited number of pupils, but attendance on the other courses is compulsory, and absence is punished. In the first year instruction in mathematics, physics, and mechanics, which all must attend, is divided into four sections, each containing about 80 pupils; and in the second year into two sections, each containing about the same number. From this it is evident that the number of boys passing from the first to the second year is reduced one-half, partly from want of elementary knowledge, partly on account of incapacity; some are taken away and others dismissed. At the end of about two months the indifferent pupils are selected from the six sections to the number of about 40 or 50 in all (or seven or eight from each section), and formed into a separate class where they receive instruction commensurate with their ability. Examinations are held at the end of the year, when a board composed of engineers and manufacturers awards prizes to the most distinguished pupils. Diplomas are granted to those who have terminated their studies and have distinguished themselves in the different subjects. The number of these diplomas varies from 25 to 30 in a section of from 80 to 90 pupils.

Recapitulating:—The number of pupils of the first year which enters at La Martinière is about 350 and reduces itself to 180 in the second year. Of these 180 leaving school at

the end of their second year, there are about 60 who receive diplomas, but it may be reckoned that as many more have received sound instruction and have obtained a satisfactory result. All almost without exception will have acquired in a remarkable degree the habit of sustained work.

The majority of the pupils of La Martinière succeed in the careers in life which they select. There are in the town of Lyons, a large number of skilled artizans who have sat on the benches of the school; the principal dyers are old pupils of the school, and to them is due the increased prosperity of the trade of the town by the remarkable discovery of the new and fashionable colours. The Polytechnic School has also received many of the pupils, and it is to their first success in La Martinière that they owe the brilliant position they have obtained, a just recompense of their assiduity.

Career of the pupils after leaving school.

The method of teaching adopted in giving general instruction seems to be peculiar to the school, and consists of a system of constant questioning and collective answers. For this purpose each pupil is furnished with a small black board; the teacher puts a question which all the pupils answer on their boards, which answers he then corrects and explains. In addition to this, the ordinary method of oral examination is also maintained, but in a peculiar fashion. The question is put, and the teacher waits a short time before fixing on the pupil who is to answer it. By both these means the attention of the pupils is fixed and constantly kept alive; none can escape showing their ignorance or deficiency. When sums in arithmetic or examples in algebra are being worked, the class is divided into three sections, and each pupil is furnished with a printed set of questions designated by letters and numbers, and two slates, one called the working slate (*ardoise de travail*), the other the answering slate (*ardoise de réponse*). The teacher selects for each section a certain number of examples in such a way that the distance between two boys working the same sum is at least five feet. These the pupils are required to work on their working slates. After they have finished they are required to transcribe one arbitrarily selected by the teacher, on to their answering slates, and these are then rapidly collected by the monitors, and spread out before the teacher in the order in which the boys are seated. The teacher is thus enabled by a rapid glance to detect those who are in fault or have failed to comprehend the principles on which the examples are to be worked.

Method of teaching employed.

The method by which descriptive geometry is taught is also peculiar, and well worthy of notice. For this study each pupil is furnished with a small tin box about 8 inches long,

Method of teaching descriptive geometry.

4 inches broad, and $\frac{3}{4}$ inch in depth. This box is filled with yellow wax, prepared so as not to turn hard. It represents to the pupil the horizontal plane of projection. The edge opposite to him is the ground line, and he can imagine for himself the plane of elevation passing through this ground line. Small strips of iron wire serve to represent lines in space, the projections on the horizontal plane by laying them on the box, and those on the plane of elevation by fixing them on the edge which represents the ground line. The movement of these strips is effected by direction of the teacher, and the pupil is enabled easily to understand a diagram in descriptive geometry.

Instruction in drawing consists of machine drawing in perspective and projection, as well as of the method of tinting. At first the pupil draws on his slate to facilitate correction and avoid waste of paper. The first models which he has to draw from are figures in iron wire representing cubes, prisms, pyramids, &c.; then he draws parts of machines, and finally complete machines. Afterwards he proceeds to drawing projections first in figured sketches, and then in drawings to scale; finally he completes his studies by learning to tint. The pupils are arranged in a circle round the model, which is placed on a stand in the midst of them. They are seated on stools carrying a stage to support the slate or drawing board. There is also a class for modelling and moulding, but it is not numerously attended.

All the pupils divided into several sections pass an hour a day in the workshops, where they are instructed in carpentry, the use of the file and of the lathe. They are practised in each of these kinds of labour alternately, and spend a month at each in succession. Here they learn the proper use of the tools, skilful and intelligent masters show and explain to them as soon as they enter that which they could learn in the manufactory only by imitating and a long course of observation. Here again the son of a carpenter, if he shows more aptitude for the file than the plane can make up his mind to enter the trade of a locksmith, mechanic, or fitter. And besides, anyone having passed through this succession of labours, has acquired a fund of skill useful to him in any handicraft.

In order to be a complement to La Martinière, and to provide for the upper classes, an equally good education as that which that school does for the children of artisans, a number of gentlemen, manufacturers, and merchants, have founded the Central School of Lyons. The capital, which at first was 100,000, and was subsequently increased to 150,000, and then to 200,000 francs, was employed partly

The work-
shops.

The Central
School of
Lyons.

in erecting the necessary buildings and furniture, partly in covering the expenses of the first few years, before the institution was self-supporting. The constantly increasing number of scholars proves that the hopes of the founders will not be disappointed.

All the pupils are day scholars only, and pay 700 francs a year, including the cost of manipulations in the laboratory, and all the courses in the workshop. With terms as high as these, of course the school is only frequented by the children of parents in good circumstances; but as the founders have kept in view the object of establishing an institution rather of public utility than for private advantage, the council of the school have created a number of half scholarships (*demi-bourses*), appropriated to several Departments, by which means a number of young persons belonging to the less wealthy classes, but whose intelligence and industry make them worthy of the benefit, can participate in the advantages of the school. When the experience of several years had proved the utility of the school, and had shown that the education given there met the wants of a large portion of the inhabitants, the Municipal Council of the city, the General Council of the Department, and the Chamber of Commerce, founded on their part a number of scholarships. Hitherto the pupils who have gained these scholarships have distinguished themselves as well by their work as by their aptitude for it. Of 80 pupils entered this year (1864), 27 are exhibitioners.

The funds of the school are now entirely derived from the fees of the scholars, and have to meet the expenses of instruction as well as those of general management. The budget at present stands thus:—

	Francs.
Expenses of instruction -	24,800
Managing staff -	5,800
General expenses, including rent, heating, lighting, &c. -	17,400
Total	48,000

The very small sum charged to the expenses for instruction can only be explained by the disinterestedness of the professors, who have voluntarily given a great part of their time to render the school a success. It is much to be desired that the resources of the school may increase to such an extent as to permit of the professors being remunerated on a scale proportionate to the excellence of the instruction which they give.

School hours are from seven to noon in the morning, and from two to six in the afternoon. The first hour, from seven

Terms and
scholarships.

Financial
statement.

Examinations
and diplomas.

Routine of the
school.

to eight, is devoted to manual labour in the workshop. Thus there are eight hours of schooling for five days in the week, or 40 hours in all, which are thus divided:—

First Year.

Mathematics	-	-	-	14	} 40 hours.
Physics	-	-	-	6	
Chemistry	-	-	-	6	
Drawing	-	-	-	10	
English	-	-	-	2	
Natural history	-	-	-	2	

Second Year.

Mathematics	-	-	-	14	} 40 hours.
Chemistry	-	-	-	6	
Drawing	-	-	-	10	
English	-	-	-	2	
Natural history	-	-	-	2	
Accounts and industrial law	-	-	-	2	
Resistance of materials	-	-	-	4	}

Third Year.

Mathematics	-	-	-	4	} 40 hours.
Mechanism and machine construction	-	-	-	7	
Metallurgy and mining	-	-	-	5	
Chemistry	-	-	-	9	
Drawing	-	-	-	10	
English	-	-	-	2	
Geology and Mineralogy	-	-	-	1	
Civil engineering	-	-	-	2	

Examinations
and diplomas.

Every Thursday there is an examination of all the sections of the school, and for the second and third year pupils, an excursion to some industrial works. General competitions at Easter, and the examinations at the end of the year, taken in conjunction with the daily notes serve as a basis for classifying the pupils, for their promotion into a higher section, and for the choice of those to whom at the end of the third year diplomas are adjudged. The examination of the pupils of the third year is held by a board composed of two professors and a director, in the presence of the council of the founders. The diplomas are of two degrees: those of the first degree are given only to those pupils whose general figure of merit corresponds to the term *very good*, and those of the second degree to the figure of merit *good*. Notwithstanding the unfavourable condition that so small a number of pupils entered the school in its first year, the number of diplomas adjudged exceeds the half of the number of the pupils who leave the school in their third year,

and one-third the number of those who enter in their first: without doubt, when the number of candidates is so great as to permit of a selection, the proportion of diplomas will be much increased. There is every reason to believe that next year (1864-65) there will be two-thirds of the pupils leaving who will have obtained diplomas. Hitherto, the managers of the school have been successful in finding employment for their late pupils. A large number are with railway engineers and in chemical works, in mines, in metal and iron works; some have gone to the works at Creusot, and several have become dyers.

The method of instruction at the Central School differs in some respects from that adopted at La Martinière, because the programme is essentially distinct. At the former it is necessary to insist on practical science as the basis of instruction, and the pupils are required to be quick and skilled in the application of formulæ, and in the calculations arising from them; at the latter it is the theoretical portions of the sciences which are of more importance, and skill and rapidity in calculation can be to some extent sacrificed. In consequence of this, the use of the small black boards already described as being employed in La Martinière, is even more extensive in the Central School. With these little boards the pupils follow attentively the reasoning of the teacher; they can even precede and foretell it. The pupils themselves discover a formula instead of following the process of obtaining it in a book or on a diagram. Of course every time a question is answered, there are a number of incorrect solutions, but this number decreases with every new attempt. At the commencement of the session, the first year pupils who have not been initiated into this method, and have hitherto been accustomed when at school to do nothing but listen more or less attentively, to work at a time most agreeable to themselves, and with doubtful regularity, experience a kind of astonishment when they find themselves compelled to work at command, and to submit their own will to that of the teacher. However, when the first moments of astonishment are passed, they are well pleased with the method; because they find it relieves them of every effort to compel themselves to work; they have only to yield to an impulse given to them.

Method of instruction.

Instruction in drawing.

The chemical laboratories are very conveniently arranged, and large enough to permit of all the pupils manipulating with the greatest facility. In this branch of their studies they acquire great skill.

Chemical laboratory.

Apart from a few philosophical instruments, indispensable to the comprehension of certain branches of physical and

Collections of apparatus.

mechanical science, the collections consist entirely of models of apparatus, and of parts of machines constructed at the school workshop specially for the purposes of instruction, either by the pupils or the foreman. In this way the already large collection of models and apparatus is continually being augmented. Besides this, there is a collection of upwards of 1,500 drawings tinted and mounted, about a square yard in size, representing figures and sections of all sorts of mechanical, physical, and chemical apparatus. These drawings have all been made at the school and in part by the pupils.

Workshops. At the workshops of the school the pupils under the direction of able foremen are practised in working at the lathe, at carpentering, at tin-working, at fitting, and at the smith's forge. Here it is no longer an object as at La Martinière to discover the peculiar vocation of each pupil, nor to give an elementary knowledge of tools to one who is to become a skilled artizan; it is rather that those whose future career will place them in a position to direct and superintend workmen, may be able to show them how to set about their work, may know the use of the tools, and the technical terms. Another object of this course of manual labour is to enable the pupil to apply what he has learnt in his theoretical studies; thus in making a tin coffee-pot, where the spout joins the body of the pot, he will apply his knowledge of the intersection of two cones, which he has acquired in the course of descriptive geometry; he will turn the model of a connecting rod in wood; in short there are a thousand ways in which he can make his theoretical studies available in practice.

Instruction in drawing. At the Central School as at La Martinière, the pupil from his first entrance begins to draw in perspective from models; then he passes quickly to projection, which is more closely connected with the labour of the workshop. As soon as he has acquired sufficient skill, the following plan is pursued: a model is placed before 12 or 14 pupils; the teacher takes it to pieces before them explains the principal arrangements, draws attention to the different forms, and after having given all necessary explanations removes the model. The pupil must then execute from memory and without instruments, sketches of the whole, and of the details and sections required by the teacher. When the time fixed for the execution of this drawing from memory has elapsed, the model is replaced before the pupils, the teacher points out the corrections to be made, and a pupil placed close to the model takes all the measurements and dictates the dimensions. The model is once more removed, and from the

sketch the pupil must now make a drawing to scale. This kind of work, and a little drawing of ornament and practice in tinting, constitute the study of the first year. During the second and third year, the pupils while continuing from time to time the drawing from memory, pass on to another kind of study. Drawings of machines are given to them, but not to be servilely copied; they are required to draw a section on a line marked on the drawing. In this way the pupil can never copy a drawing without understanding it; he must analyse it in all its particulars for himself. To others, again, is given a drawing, as for example of a steam-engine, taken from some work on machinery, together with the text which accompanies it. The teacher explains to the pupil a certain portion of the machine—the cylinder for instance, with the arrangement of its parts; the latter must then draw every piece of it (as if it were taken completely to pieces) to a certain fixed scale. When this work is finished the copy is removed, and the pupil must proceed to draw the whole from the drawings which he has already made of the parts. In these two divisions the young men are also practised in making designs of parts of machines according to the principles of the strength of materials which they have learned in school; designs for boilers according to the principles of physics; designs of machines or of buildings of all kinds as applications of the sciences which they have studied at school. As a supplement to the study of drawing, the pupils of the second and third years visit every Thursday certain manufactories which are fixed upon, and must bring back figured sketches of some of the machines; these they must afterwards reproduce as finished drawings to scale. Afterwards from all these drawings a selection is made of those which possess most interest, or are of the greatest utility, and these being lithographed, an album is made intended specially for the use of the pupils of the school.

In reply to the question as to what is necessary to be done for technical education in France, M. Girardin commences the exposition of his views by dividing the pupils for whom such an education would be a benefit into four classes:—1st. Children of the working class before entering on their apprenticeship. 2nd. Children of the same class already entered on their apprenticeship. 3rd. Adult artizans. 4th. Young persons of the wealthier class.

La Martinière school may be taken as a type of the school required for children of the first description. It must be remarked however that 400 children at the most present themselves every year for admission to this school, from among a population so large as that of Lyons, it is there-

Views of M. Girardin on what should be done for technical instruction in France.

Schools for children of the working class.

fore reasonable to suppose that in towns of less importance similar schools could be created on a much smaller scale, with scarcely more expense than that for the primary schools. Two or three rooms of a size commensurate with the number of children it would be necessary to accommodate would be enough for all practical purposes.

Courses for apprentices.

Apprentices can only give a very limited time to the study of theoretical subjects; it is not a school which they want, but special courses of instruction held on Sundays and in the evening. These courses might be held in the same places and under the same teachers as those of the schools recommended for the first category, especially in the great manufacturing centres. For the pupils of these two classes the attendance at the instruction, either by authority of their parents or of their masters, should be compulsory.

Lectures for adults.

For adult artizans already courses of evening and Sunday lectures have been established in most towns, but M. Girardin holds that in general they have been attended with some inconvenience. These lectures are in most cases open to every one, and consequently to distinct classes among the audience; the serious audience who come to be instructed, and the curious audience which as regards numbers is generally vacillating. The presence of people who are unknown to them disconcerts those who attend for instruction; they are hurt if they have to show their ignorance, and the teaching becomes of small value to them. The lecturer is compelled to enter into too many details for those who know already, and cannot give sufficient for those who have no prior knowledge of the subject. As an instance of this the evening courses of lectures established at Lyons by the managers of La Martinière and by the Society for Primary Instruction (*Société d'Instruction primaire du Rhone*) are not attended by a number of adults at all in proportion to the population of the city. To avoid these obstacles M. Girardin would recommend the transformation of these lectures into classes, to which only those would be admitted who could subscribe a fee for the instruction they are to receive and thus show their desire to profit by it.

Secondary schools for the wealthier class.

It is assumed by M. Girardin that the institutions for the three above-mentioned classes would to a great extent give gratuitous instruction, and therefore to maintain them in an efficient condition government assistance would be required; this on the contrary would not be the case in schools founded for the wealthier classes. If a school of this description really meets a want it ought at the end of a certain time to be self-supporting, and the necessity for causing it to flourish would be for those who have an interest in it, a powerful

stimulus to introduce all improvements which can tend to its success. But though in these new schools of a higher degree the fees demanded from the pupils ought to suffice for their support, it can scarcely be claimed that they should be reserved for the class who are in a position to pay for themselves. Here it is that the State can effectually step in by endowing the schools with scholarships and exhibitions which will permit of pupils in less easy circumstances availing themselves of an instruction which would otherwise be beyond their means. Such an encouragement as this on the part of the State would be of immense service to the youth of the working classes, and be one of the best means of increasing the industrial power of the country.

M. Girardin also alludes briefly to the School of Art (*École des Beaux Arts*) established at Lyons. Notwithstanding the success of the pupils of this school as designers, the manufacturers now nearly all resort to the offices in Paris for designs which were formerly executed in Lyons itself. Now-a-days every nation can buy taste, paying for a design in the same way as he would pay for any other marketable commodity, and whoever has the most money will be the highest and last bidder.

School of art
at Lyons.

Evening
classes

Evidence of M. J. J. Bourcart, Manufacturer at Guebwiller, Founder of the Popular Courses at Guebwiller.

The substance of this evidence has been given almost at length by the Commission in the Notes to their Report ; it is unnecessary to repeat it here. It will be found in the translation of the Report and Notes of the Commission on Technical Instruction, p. 138 to p. 149.

Decline of
the school.

Evidence of M. Leloup, Honorary Director of the Upper Trade School at Nantes.

This school was founded in the year 1834, under the title of the Upper Primary School (*École Primaire Supérieure*), a name which gave no idea of the instruction carried on in it. Notwithstanding this, however, 60 pupils took their seats on the forms of the school; and this number would have been greater had a boarding house been annexed to the establishment. The next year the school numbered 90 pupils, of whom 25 were exhibitioners maintained by the commune and 65 paying a monthly fee of 5 francs. The exhibitioners were admitted by public competition open to the children of 12 years of age and upwards on leaving the elementary schools, and they were the sons of artizans, foremen, small

History of the
school.

tradesmen, and employés in the public offices and large commercial houses, while the paying pupils belonged to parents in easy circumstances and to several members of the Municipal Council. For the first expenses of the establishment the Council General voted a sum of 500 francs, and the Minister of Instruction added a grant of 1,000 francs. In the second year of its existence the revenue of the school (including the buildings granted by the Municipal Council) amounted to 10,000 francs, and the number of pupils to 100. The amount of the monthly fees was divided among the professors in proportion to their salaries. At the end of the third year, the number of pupils had increased to 40 exhibitors and 70 paying pupils; public examinations were held twice a year, and the Municipal Council through a special commission were informed of the progress and good results of the school.

Evening
classes.

At this period free evening classes were established at the school to enable working men to acquire a knowledge of theoretical science which they found so requisite in their trades. These classes were held in four subjects: industrial chemistry, elementary mathematics, geometry, and mechanics, and were attended on an average by 100 students yearly. The instruction was voluntarily given by the professors of the school, but at the end of three years their salaries, which only amounted to 1,500 francs for each, being so exceedingly small they were obliged to give up the gratuitous portion of their labours.

Decline of
the school.

In 1840, after six years passed in a temporary abode, the school was removed to a building belonging to the town of Nantes, which had formerly been occupied by the Primary Normal School. This change of residence seems to have affected the fortunes of the school badly; the building is far from the centre of the town, and there are no means of extending it so as to make a boarding school of it, nor is there room for re-establishing the night classes. Notwithstanding this drawback, however, the success of the school was maintained until the year 1848; at the end of that year the number of pupils amounted to more than 200, including an elementary school of 40 pupils which was a sort of nursery for the professional school. At that time the annual expenditure amounted to 17,000 francs, of which 1,000 only came from the General Council; there were 75 exhibitors and 115 paying pupils, and the monthly fee had been raised from 5 to 8 francs. Now, however, the prosperity of the school began to decline, and in 1853 M. Leloup himself was compelled in consequence of ill-health to resign the management. When he left there were 196 pupils, of whom 65 were exhibi-

tioners and 53 belonged to the preparatory division, and the monthly fees of the latter were only sufficient to cover the salary of the master and assistant master of that division. The revenue amounted to 13,000 or 14,000 francs, of which about 8,000 francs came from the municipal treasury. There were eight professors and two assistants, who gave the following courses of instruction: 1, a course of industrial chemistry, physics, and natural history; 2, a course of mathematics and mechanics for the scholars of the 3rd and 4th years; 3, a course of elementary mathematics and book-keeping; 4, a course of descriptive geometry; 5, of artistic drawing, and modelling; 6, of history and geography; 7, of English; 8, of religious instruction and moral philosophy; 9, of vocal music. Physical science, particularly chemistry and its numerous applications, formed the key to the whole course of instruction of the school; the programme and progression of the studies were drawn up entirely with reference to it.

From 1853 to 1862 the school has passed successively under the management of two directors, but it continued to decrease in point of numbers until in the latter year it was attended by only 50 pupils, of whom 18 were paying. It was in this year that M. Leloup in the capacity of honorary director was called on by the Municipal Council of Nantes to discover the causes of this decline, and to find a remedy; and with the aid of the actual director and of the zealous professors he hopes to have launched the school in a new course of prosperity. During the past year (1863) the number of pupils has more than doubled.

The school is now recruited principally among overseers, foremen, petty officers of the public services, small manufacturers, retail tradesmen, &c. As regards the placing of the pupils, it may be stated that all those who have attended the school during the four years of study easily find situations on their leaving. But many are taken away at the end of the third year by parents who are compelled to profit by the labour of their children; of this number are those who enter the paternal trade, of whom the school can count nearly 300. About a third of the whole number pursue the trades of the chemical and the machine manufacturer, and another third is absorbed by the mercantile houses, public services, special schools, and mercantile marine. It is a remarkable fact that so many adopt the trades of their fathers. As several of the pupils have entered the mercantile marine (there are above 40 who are now masters of coasting vessels and captains of ships), it has been found advantageous to give a course of instruction in spherical trigonometry and

Re-appoint-
ment of
M. Leloup.

Constituency
of the school.

Proposition to
establish
evening classes
in connection
with the trade
school.

physical geography, in drawing of maps, &c., though much remains to be done to render effective any special instruction for mariners.

Workmen,
properly so
called, not
educated at
the school.

It must be understood that the school produces chiefs of workshops, clerks, and foremen, but not workmen properly so called. Workmen can only acquire the practice of their art by apprenticeship in the workshop and by the use of tools, which cannot be afforded in schools of the order of the Trade School of Nantes. For such schools to give instruction in the theory of sciences, which can be applied to manual labour, by means of well managed evening classes seems to be the best service which they can render to the working classes to raise them above the ordinary level, and advance them in the path of progress. But there exists at Nantes an apprentice school (*école d'apprentissage*) founded by the Industrial Society of that place (*Société Industrielle de Nantes*), which has been of great service to the working classes, and which might be taken as a model for an institution of this sort.

Apprentice
society at
Nantes.

This society charge themselves with the care of children whose parents are too poor to teach them a trade; they place them with a master, arrange the indentures, regulate the conditions and length of the apprenticeship, look after both apprentice and master, and finally grant to the poorer aid both in food and in money, a part of which last is deposited in the savings bank. Out of his working hours the apprentice receives in a school established purposely for him lessons in drawing, geometry, &c. to complete his primary education. The society pay the salaries of the teachers, provide the class material and furniture, and award every year prizes to the most meritorious. Even after they are out of their time the connexion of the apprentices with the society does not cease; they can still compete for diplomas of ability (*diplômes de capacité*), a sort of extra prize which places those who obtain them in the first rank of their trade. The society, which dates from the year 1830, is aided in its efforts by grants from the General Council, the Municipal Council, the Minister of Public Instruction, and the Minister of Commerce, Agriculture, and Public Works.

Proposition to
establish
evening classes
in connexion
with the trade
school.

The evening classes for apprentices are very well attended, and Mr. Leloup is anxious to re-establish those which formerly existed at the Trade School. He is of opinion that the instruction in such classes should bear on the following subjects: A course of graduated, and above all practical, instruction in arithmetic and geometry, without theoretical demonstrations; linear and art drawing; the French language, dictation, and exercises on the black-board. In

addition he recommends a course of social and industrial economy, which should particularly treat of the relations between labour and capital, between the employer and the employed; of the duties of a man towards the State, society, his family, and himself; of the conditions of free labour and the necessary connexion between right and duty; and, lastly, of the simple ideas of religious morality. It might be desirable that lessons in modern history and in vocal music should be given to complete this instruction, and that a well-chosen communal library should be opened and placed at the disposal of the working man, but under the responsibility of the director of the Trade School.

In reply to the question as to what should be done in France to develop technical education so as to be of benefit to industry in general and to the working classes in particular, M. Leloup gives it as his opinion that no uniform list of subjects, nor absolute programme, can be laid down so as to meet all the different requirements of the various classes. If the elementary education must be the same for all, that is to say, if there is a foundation of elementary education which is necessary to every one, it follows that when once this has been acquired the instruction must be subdivided and specialized, and made to meet the wants of every description of manufactures, and the positions which correspond to them. He would recommend after the primary schools the following institutions for those who are to engage in industrial pursuits:—

Views of
M. Leloup on
what is neces-
sary to extend
technical edu-
cation in
France.

1. Apprentice schools (*écoles d'apprentissage*) on the type of that founded by the Industrial Society of Nantes for artisans.
2. Trade schools (*écoles professionnelles*) for employers and heads of manufactories, or at least for overlookers, managers, chief clerks, &c.
3. Special schools (*écoles spéciales*) of which the type should be the Central School (*École Centrale des Arts et Manufactures*), forming a sort of technological faculty, for those who are to have the chief management of works of art and industry, and training heads of schools and professors of the intermediate schools.

The industrial army would thus draw its soldiers from the apprentice schools, its officers from the trade schools, its general officers from the special schools. This progressive system could be easily apportioned: thus, in the apprentice schools, reading, writing, cyphering, geometry, linear drawing, drawing of ornament, and the mother tongue; and, as a complement to this, evening and adult classes. In the

trade schools superior primary instruction; then history, geography, physical geography, literature, drawing, mathematics, physics, mechanics, chemistry, natural history, accounts, commercial law, &c.; each of these branches to the degree that might be necessary. In the special schools all the higher studies, scientific theories and their applications in general, everything in short which is necessary for those who are to have the management of great undertakings in arts, manufactures, or commerce.

Proposed organization of trade schools.

For the organization of the trade schools M. Leloup recommends:—

1. Three years of preparatory study, compulsory on all the pupils, and giving them a common education.

2. Two years of the study of science applied to industry in general and to some local specialties in particular.

For the three years of preparatory study a uniform programme; for the two years of special study a variable programme, according to the locality and the requirements of its manufactures and commerce. Lastly, for all the classes, courses of social, political, and industrial economy, and a knowledge of constitutional law, graduated according to the age and ability of the pupils. It may seem that the programme for the upper classes of the trade schools may become too varied for any general arrangement, but it is not so in reality. During the first term of the fourth year the pupils should be required to take a survey of what they have learnt in the three preparatory years, and decide, with the permission of their parents, on attending one of the following divisions of special study: 1. The chemical arts; 2. The mechanical arts; 3. The agricultural arts; 4. Navigation and naval construction; 5. Public works and commerce; 6. Special schools. Omitting the fourth and sixth of these, it may be conceived that careful study in the laboratory of chemistry, applied to the reproduction of a great number of industrial products, and to processes; then the analysis of raw materials, minerals, soils, manures, products of the soil, &c.; the fitting and modelling of different kinds of machines, the application of descriptive geometry to the construction of buildings and manufacturing machines and tools; lastly, an attentive consideration of commercial details, and of the ways and means of transport;—all these would form a course of special instruction for the pupils who terminate their studies at the end of the fifth year.

How technical schools should be founded and maintained.

In considering the question of the support of these institutions, M. Leloup believes that the lower class of schools—those for apprentices and night classes for working

men—may be left to private resources (as those of a free society) and to private management. The efforts of philanthropic individuals, or of associations of individuals, are a noble example for the working man, and tend to neutralize the unfortunate antagonism which so often exists between capital and labour. Moreover, it is only to such a society that the charge of watching over an apprentice and the carrying out of the conditions of his apprenticeship could be confided. But the trade and special schools occupy a different position, and must be left entirely under the care of the State. It is the State alone which possesses the administrative power and the unity of sentiment necessary to create this new system of instruction, whose success would be uncertain in other hands. It alone (and this is very important) can remove the prejudice of inferiority attached by parents to communal or private instruction when compared with the State education given in the lycées. It might be thought sufficient to intrust the management of these institutions to the municipal or departmental authorities; but the local character impressed on public schools is always of less authority in the eyes of parents than that which is possessed by a Government institution. The councils of the departments and of the communes should only be called on to participate in the establishment of secondary schools for special objects in three ways: 1. To provide a building under the conditions exacted by the State; 2. To found and maintain a certain number of scholarships; 3. To make an annual report to the Minister on the modifications, improvements, alterations, and additions which there will be any room or necessity for introducing into the studies of the fourth and fifth years—a means perfectly necessary in order that the requirements of the locality may be made known.

Evidence of M. Rossat, Doctor of Science, Head Master at Charleville.

When M. Rossat took the school at Charleville at the commencement of the scholastic year 1853–1854, it contained about 130 pupils, who received primary instruction until the age of 12 to 14 years, and then a professional instruction given in four divisions corresponding to the four remaining years of study. The subjects of this instruction consisted of the French and German languages, history and geography, mathematics, physical science, drawing, and book-keeping, and were intended to prepare pupils for such of the public services as required a diploma, for some of the special schools, such as those of St.

Account of the progress of the school.

Cyr, Châlons, and Alfort, and for commercial and industrial pursuits. On M. Rossat's succession he commenced by extending the professional instruction, while still pursuing an organization which appeared to respond to the wants of the country, by establishing by the side of it a secondary instruction to prepare pupils for the two bachelorships (*baccalauréats és lettres et és sciences*). From the very first he began to modify the organization of the professional classes by increasing the number of divisions from four to six, and by adding a seventh and last year specially for mathematics as a preparation for the Central School (*École Centrale des Arts et Manufactures*). This instruction is parallel to the secondary instruction in Latin, while all the subjects which are common to the classical and professional divisions are taught to the whole school together. The mixed classes are held in the afternoon, while the hours of the morning are devoted on the one side to classical, on the other to industrial studies. For the more practical part of their training the pupils had been in the habit of attending the workshops of locksmiths, carpenters, and blacksmiths in the town, but it was found that this habit was fatal to discipline and morality, and accordingly M. Rossat determined upon creating a workshop of his own. For this purpose he rented a large estate close to the school buildings, the house of which had been used as a magazine during the period of the continental blockade. He has now established there a fitting shop working by steam and capable of containing 100 anvils, several lathes, boring machines, portable forges, etc.; a carpenter's shop with lathes, sawing machines, and benches; a smith's shop with room for 20 men; a good laboratory with separate tables for the pupils; a lecture theatre capable of accommodating an audience of 150; a gymnasium, covered in; and a large garden for practice in botany, agriculture, and arboriculture.

The workshops
and laboratory.

A count of the
to progress
the school.

Altogether M. Rossat has observed that the practical are in no way injurious to the theoretical studies. On the contrary in the subjects descriptive geometry and industrial drawing manual labour seems to stimulate the pupils. Practical work in the shops and laboratory occupies two hours a day, and yet the pupils beg that that time may be extended; already many of them possess great skill. The shops and all the works are under the direction of a civil engineer, and under him are three foremen, one in the fitting, another in the smith's, and the third in the carpenter's shop. The proceeds of the labour of the pupils, if any, goes towards the maintenance of the workshops. In the fitting shop the most skilful pupils are at present occupied in putting together a steam engine to replace the portable engine which now drives the machinery;

others are making models and parts of machines to be placed in the machinery collection of the museum. The carpenters, of whom there are about thirty, learn the use of the saw, the plane, and the lathe; they make patterns for the iron casters, joiners' work, and carpenters' work, and models for solid geometry. There are fifty smiths engaged at the forge in the repair of tools, &c.; and in the same shop there are employed a few pupils who are intended for the veterinary schools. Lastly, under the direction of the head master himself, the remaining pupils are occupied with manipulations in the laboratory.

There are now altogether 330 pupils, of whom 170 are boarders. Besides the ordinary classes in literature and science, there is a class in applied mechanics, another in construction, a third in industrial drawing with copies in relief, and also one in commercial and administrative law. The pupils are admitted to the laboratory for manipulation, either for two hours or during the whole day. Manual labour is carried on in the workshops for two hours a day, five days in the week. Pupils who are intended for agricultural pursuits also take part in the duties of the workshop; out of school hours, or early in the morning during summer, they can practise in the botanical garden or in the kitchen garden; twice a week they make excursions in the neighbourhood to botanize, to inspect the fields and the method of cultivating them. The same pupils attend the lectures of the professor, a veterinary doctor, on applied zoology, and during three hours a week they learn the theory of the sciences bearing on their future profession.

Course of instruction.

It has been a great object with the head master to prevent any kind of distinction being established between the literary and scientific divisions of the school, so that there may be no jealousy among the pupils. With this object he keeps together during play-hours, in the study-rooms, in the refectories, and in the dormitories as much as possible the students of the corresponding sections of the two divisions; and if the number of such a combined class should become so great as to make two divisions of it, he would do so by making the pupils draw lots. He regards it to be of great importance that the professional should be placed on the same level as the classical studies; there should be no rivalry except in industry and good conduct. However, the number of pupils in the professional is greater than that in the classical division; there are at most a third of the whole number in the latter, the rest are in the primary and professional divisions.

Jealousy between the two divisions prevented.

The school draws its pupils principally from the lower middle class, though the establishment of the workshops

Clientèle.

has considerably increased the number of those in more easy circumstances. The boarders are admitted at 8 years old, and the day pupils as early as 6 years; children of these ages join the primary division. As soon as they are well grounded in the elements they are taken into one of the great divisions—professional or classical—according as their parents may select. The professional course consists, as has already been stated, of six classes corresponding to the six years of study, but an intelligent and diligent boy can pass through two classes in one year without leaving any gap in his studies; for it is so arranged that the subjects of instruction in each class shall be completed by the month of April, the rest of the year being devoted to repetition, so that a lad of ability removed from the lower class can follow with advantage the lessons of the class into which he is removed. Some of the pupils destined for the public services pass their examinations before reaching the higher classes, but the greater part remain to the end; such are those who are to become manufacturers, builders, ironmasters, and farmers. Others with less ambition only aspire to the position of foremen. It has been in contemplation to establish night classes for workmen, but hitherto the want of accommodation and the great occupations and pecuniary position of M. Rossat have not permitted of it.

Finances.

The terms for boarders are 600 francs a year (not including school materials), with an additional 100 francs for the use of the workshops and laboratory. For day boys the terms vary from 50 to 100 francs a year according to the class which the pupil attends. The school is entirely a private speculation of the head master; he receives nothing in the way of grant, either from the town or the department. His predecessor had 600 francs a year from the municipality of Charleville, in the shape of exhibitions for the day pupils, but these have now been allowed to drop. He has invested a total capital of 300,000 francs in the purchase of buildings, furniture, and materials, and notwithstanding the lowness of the terms and the existence of a staff of 25 professors, teachers and foremen, the establishment is remunerative.

Perfect freedom of action of M. Rossat.

The result of these circumstances, however, is that M. Rossat is perfectly free in his movements, and can introduce any arrangement into his school or any alteration in the programme which he pleases. Thanks to this liberty of action, not only the success of the whole school, but also the progress of each boy has been highly satisfactory. In the course of ten years 300 pupils have passed the examination of bachelor, or have entered the special schools, or been admitted into the public services, without counting those

who have been received into private manufacturing houses; last year (1863) for example, out of 34 nominations, 31 were successful. Another consequence of this freedom is, that the programmes have been so arranged that a pupil can pass from the professional to the classical division or *vice versa*, according to the wishes of his parents or his own predilection.

It has been stated that M. Rossat entertained the project of opening night classes for adult artisans, which, provided they were well organized, would, he is sure, be well attended. He intends to put himself into communication with the manufacturers of Charleville-Mezières, who employ a large number of workmen in the iron founding, smelting, sugar-baking, and brushmaking trades, and from whom he hopes for great assistance. He would use his influence with these gentlemen, most of whom he knows from their having children at his school, to obtain a diminution of the hours of labour of their apprentices, on condition of their attending the classes. He is also not without hopes of securing pecuniary aid for the night classes from the municipality. To interest the workmen, and to guard their *amour-propre*, he would demand a small fee for attendance, the proceeds of which would be spent in reading and class books. It would also be an advantage if the adult pupils could be questioned during the lessons, but this would require to be done delicately for fear of wounding their pride and exposing them to ridicule. The means for establishing such classes are abundant enough. All the professors and teachers of the practical school have voluntarily and gratuitously offered their services for both the primary and secondary instruction of adults. The institution itself could provisionally provide all the materials necessary for teaching; machines of all descriptions, copies, casts and decorations. In the lecture theatre would be given the lectures in applied mechanics, practical geometry, physics and chemistry, accompanied by models, apparatus, and experiments; in the drawing room would be held the classes in drawing, provided with copies and models. Lighting and firing would also be at the expense of the institution; and with all these elements of success M. Rossat has no doubt of arriving at a good result.

Project for
night classes
for adults.

Replying to the question, what should be the nature of the efforts made by Government for organizing a complete system of technical instruction, M. Rossat divides such instruction into two categories, secondary and primary. For secondary instruction he recommends that existing schools which have not prospered should be transformed into technical schools with workshops attached to them, while schools

Views of
M. Rossat on
what is wanted
to improve the
state of techni-
cal education.

which have hitherto been successful in their theoretical studies should have a course of practical instruction added to them. As regards the new institutions which it is intended to establish, their organization must rest upon the principle of the theoretical combined with the practical, that is to say, of a literary and a scientific division running parallel to each other. But both the founding and the maintaining of them must be left to private effort, the action of the Government being confined to encouraging and stimulating, either by honorary rewards, such as diplomas, or by scholarships and exhibitions; it is under these conditions alone that the institutions can preserve that freedom of action so necessary for their success. Let only the circumstances be favourable, let the departments provide buildings, and the Government offer pecuniary aid, and there will be no lack of able and intelligent men willing to take upon themselves the responsibility of keeping schools for technical instruction. Only place the two divisions, the literary and the scientific, on the same level, so that there may be no rivalry between them, except in respect of the services which they render, and men of worth will devote themselves to the one or the other according to their tastes and capabilities.

Technical
instruction in
primary
schools.

For primary instruction intended for the children of working men not so much requires to be done. M. Rossat would only recommend that drawing should be taught in all the elementary schools, and that the children should be kept longer at school. In this way the gap between the primary schools and evening schools for adults and apprentices, would be nearly filled up, and the apprentice would possess sufficient elementary knowledge to profit at once by the scientific study in the night school. Evening classes might also with great advantage be established in the country districts, where, with a slight addition to their salary, the national school masters (*instituteurs*) would be glad to devote an hour or two every evening to maintaining their relations with their old pupils. Might it not also be possible to have by the side of the village school an experimental garden where the children could acquire a love for flowers and plants, and learn the treatment of fruit trees and the cultivation of vegetables?

Programmes of
study and
systems of
instruction.

Being asked if he could approve of programmes of study and detailed schemes of instruction to be laid down by Government, M. Rossat would prefer that each head master should be allowed perfect freedom of action to make his own arrangements, to press those points which he may deem most important, and to fill up any gaps that he may discover. Programmes only make of the teacher a perfect machine, and hamper and cramp him at every step. Besides, it will be

necessary that a technical school should adapt itself to the industry of the district in which it is situated; in one place it must be a mining school, in another a weaving school. All this would be impossible under a general system of instruction emanating from the Government.

In one way the Government can render great service, by Diplomas. creating diplomas for schools of this description; there is such a diploma for pupils leaving the Schools of Arts and Trades, and why should such not also be given to the students of a school like the Practical School at Charleville. It is not uncommon, says M. Rossat, for a pupil of his to complain, "When we leave the school at Châlons we shall receive a certificate or testimonials which will aid us in getting situations, but we have nothing of the sort when we leave your school. Your signature may be perfectly respectable, but it does not carry the weight of that of a director of one of the schools of arts and trades." If there were diplomas for pupils of the private schools, they would not only be a guarantee of ability, but would also serve as a stimulus to the young men who are preparing themselves for a commercial or industrial career, or for the public services.

Evidence of M. Malet, Superior Officer, Professor at the Imperial Artillery School at Douai.

The educational institutions of the town of Douai may be divided into two essentially distinct groups—the primary schools and the public classes, or technical classes as they may be called. The primary schools are four in number, one of them being an upper school, and they cost the town annually 1,500 francs; the technical classes receive aid from the town to the same extent, and consist of the following subjects:—

Educational institutions at Douai.

1. A class in building and machine construction.
2. A class in drawing.
3. A class in writing.
4. A class in modelling, sculpture and moulding.
5. A class in manual labour in wood and in iron, for the purpose of training journeymen carpenters, joiners, fitters, smiths, turners in wood and iron.
6. A class in music, a sort of conservatory which provides young persons, if not with a profession, at any rate with the power of increasing their means of living.
7. A class of designing for embroidery (suppressed in 1848 for financial reasons) was attended by more than a hundred workwomen, and could with little trouble be re-established.

All these classes are attended by upwards of 200 young people from 12 to 18 years of age, and even beyond; they are in general pupils of the primary schools, children of artisans, pupils of the Lycée, apprentices, and clerks.

Class in
construction.

1. The class in construction includes all the scientific studies which bear on the construction of machines and buildings, and their practical applications. Commenced in 1790 it was in 1805 transformed into a special class of architecture, to which in 1831 an industrial class was attached, at which time also it received the name of class of industrial architecture (*cours d'architecture industrielle*) until the year 1849, when M. Malet assumed the directorship of it and adopted its present form. This class, like every other, meets in a building of its own; it costs the town annually 2,500 francs, and is directed by a professor and his assistant. It meets on Tuesdays, Thursdays, and Saturdays for one hour and a half early in the morning, when it is attended principally by apprentices, and from ten to twelve for schoolboys and clerks. The annual average number of attendants is 80, of which about two-thirds belong to the working classes. Every one able to read and write fairly and knowing the first four rules of arithmetic is admitted. Adults are permitted to attend, but there does not seem to be any disposition on their part to make use of the advantages offered to them, although the class has met in the evening and on Sunday specially for their benefit. The class is entirely free, only pupils must provide themselves with drawing materials, and the poorer members are even furnished with these at the expense of the town. Every pupil on admission writes down his trade or profession, or that which he wishes to adopt, and this serves as a guide to the professor as to the special studies which he should undertake.

Method of
instruction.

The instruction is divided into four sections: — 1, the preparatory section; 2, the industrial section; 3, the section of science and fine art; 4, the section for applied study. The latter of which the work is executed either in the apprentice workshop or in those of the masters differs essentially from a simple apprenticeship in that the forms which the material is made to assume are explained to the pupil, and executed according to fixed principles, thus combining intelligence with skill of hand. In each section the course of study takes on an average two years, and therefore amounts to about six years altogether. Each section corresponds to a particular class of trade. The *preparatory section* corresponds to the different handicrafts; the object of it is simply to enable the pupil to learn and execute all kinds of industrial drawing, by means of geometry, either in two or three dimen-

sions, and to make known its applications to the different kinds of projections by means of plans and elevations of sections. The *industrial section*, attended by those pupils of the preceding section who wish to push their studies further, takes in the subjects necessary to the trades engaged in the construction of machines and buildings, such as joiners, carpenters, upholders, stoneworkers, marble masons, locksmiths, fitters, stokers, painters, &c. The pupils of this section form excellent workmen, foremen, superintendents of works, surveyors, designers, &c. The *upper or scientific section* is attended by pupils who having been successful in their studies in the two former divisions, are able to attain a higher position in their trades, or are preparing themselves to become civil and mechanical, engineers, chiefs of works, clerks of works (*conducteurs*) in the service of the Bridges and Roads, and architects; some even proceed to the Government schools. In this section are taught mathematics, pure and applied, mechanics, descriptive geometry, constructions, architecture, &c. The *section for applied study* comprises the pupils of the first and second sections and of some of those of the third; the course of instruction consists as its name implies of the execution by the pupils of works either in wood, iron, stone, or even papier mâché, designed to illustrate the results of their theoretical studies by means of templates taken from the rough sketches.

Every year is held a competitive examination under a board composed of scientific and industrial notabilities, who pronounce on the merit of the competitors and on that of the scientific and practical works which they have executed, and which are publicly exhibited. Prizes are awarded by the municipality of the town. No diploma is given; it would be indeed unnecessary, for the works which they can execute and the recommendation which they get from the managers of the classes are quite sufficient to obtain good positions for the pupils. Examinations and diplomas.

Attached to the classes are two apprentice-workshops, one for working in wood, the other for working in iron, each in charge of a director who is engaged to give in it practical instruction in manual labour. These workshops are situated in an annexe of the town hall which contains the normal school and the upper primary school. The practice includes in the one shop working at the forge, fitting, and turning in metals; in the other joining, carpentry, upholstery, and turning in wood. It is expected that in time these shops will be capable of turning out work which can be sold and become a source of profit to the institution. The number of pupils is nearly 50, about equally divided between the Apprentice workshops.

shops. Work is carried on every day except Thursday and Sunday, it begins at half-past five and concludes at half-past eight in the morning. The management of the workshops is intrusted to the master, who is director of the primary school, but under the control of a committee.

Class in
drawing.

2. The class in drawing meets every day from half-past twelve to two o'clock, formerly it used to meet from five to seven, and probably the old arrangement will be resumed as it had the advantage of accustoming the pupils to draw both by artificial light and by daylight. This class contains about 70 or 80 pupils of from 13 to 14 years of age. As to the method of instruction, it is that which is generally adopted; the basis is the study of the figure, and effect is obtained by line shading. But this method, though good in principle, is in the opinion of M. Malet not one which is to be recommended for those who are not fine art students, but have need of the power of sketching rapidly and accurately. He would wish to see introduced three divisions, one preparatory, another industrial, and the third artistic for the students who wish to become artists and aspire to the Fine Art School (*Ecole des Beaux Arts*).

Class in model-
ling, sculpture,
and moulding.

3. The class in modelling, sculpture, and moulding is held every morning from seven to half-past eight o'clock in summer, and from six to eight in the winter. There are 25 or 30 pupils whose ages vary from 13 to 15 years. As in the class of construction this class is divided into three sections: in the *preparatory section* is practised modelling of the figure and of ornament, and this is attended by all the pupils without exception. The *industrial section* includes sculpture both in wood and in stone; it is attended by workmen or sons of masters who have been several years in the class. Lastly the *upper section* is devoted to the execution of designs (*projets*) of industrial art designed on a given plan; it is attended by those students who having passed through the other sections wish to become sculptors, but cannot attend the ateliers of the masters. In the two latter sections moulding after different methods is taught. Pupils who desire to make art a profession, model without intermission the best examples of ancient sculpture, then with the sanction and under the guidance of the professor they proceed to Paris to continue their studies, sometimes at the cost of the town or the Department.

Class in
writing.

4. The class for writing is held every evening from half-past five to half-past seven o'clock, and is attended by about 30 pupils, of 14 and 15 years of age. This class is also divided into three sections: the *preparatory section*, in which the students get rid of the bad habits contracted in their earlier training; the *industrial section*, in which the pupils

are initiated into different kinds of commercial writing; and lastly the *upper section*, in which they learn signs and characters sometimes employed in manufactures, and certain ancient and artistic kinds of writing.

5. The academy of music, which offers to young people of the working class a pleasing recreation, may also shortly be alluded to, distinguished as it is by the talent and zeal of its professors. The classes commence at half-past six in the morning and last till noon; they are held every day, and contain on an average 70 pupils.

Musical academy.

The question of what is necessary to be done that professional instruction may be extended and developed in France to the greatest possible extent, appears to M. Malet to be on a fair road of solution by the exertions of the Commission before which he is giving evidence, and by the appointment of the Sub-commissions to collect information in what is being done in the same direction in England and Germany. From this inquiry will result a general project for the organization, as well as a plan of the different studies, upon which the Commission can, if it pleases, again consult competent persons. M. Malet's own views lead him to propose the creation of a Superior Council of Professional Instruction (*Conseil supérieur de l'Enseignement professionnel*), holding its sittings at the Ministry of Public Works, which could be charged to make the system known in the different localities by means of inspectors, and those localities would then form Municipal Committees (*Comités Municipaux*). The Municipal Committees should be composed of competent persons appointed by the Prefect upon the presentation for selection of a certain number of names by the local administrative; the chairman of the committee might be appointed directly by the Minister, at the instigation of the Prefect, in order to avoid local irritation. Such a plan would possess the advantages of a central administration, while permitting the different localities to adopt a kind of instruction most suitable to the wants of each district.

Views of M. Malet on what is necessary to extend technical instruction.

In principle the action of the Government should be purely that of giving moral support, for technical instruction is undertaken more in the interest of the locality than in that of the State. But in reality if this important question were allowed to wait for the initiative of the communes, many years would elapse either through indifference or ignorance before it could be taken into serious consideration. It would appear then necessary that the Government should strengthen its policy of giving moral support by making pecuniary grants and by scholarships founded in certain schools;

Action of the Government.

Resumé of the
opinions of
M. Malet.

and further that it should encourage by public assistance the schools which have been founded by private energy.

Summing up his opinion, M. Malet thinks that technical instruction should be established on the same footing as that of science and literature by dividing it into three parts, primary instruction, secondary instruction, and upper instruction. The former of these would be largely attended, and should be extended even into the rural districts. This general organization should be allowed to adapt itself to the staple trades of any particular localities, which, while preserving their liberty of action, would require a little stimulus occasionally. Not that the instruction should be broken up and subdivided among different districts and departments, but the same results might be produced by taking as the basis of industrial instruction that in the construction of buildings and machines, and adding to it instruction in the sciences applied to the special industries of the locality. The direct action of the Government, while respecting the efforts of the localities, should be limited to the creation and maintenance of scholarships, which would form an indispensable encouragement in order to overcome local indifference, jealousies, and inertia.

Evidence of M. Aimé Gros, Manufacturer at Wesserling (Haut-Rhin), Member of the Legislative Body.

Schools at
Wesserling.

The manufacturing establishment at Wesserling being completely isolated and distant from any place of importance, the proprietors have found it necessary to provide instruction for the children of their employés and workpeople. With this object they have founded both a primary and a secondary, or rather as they call it an intermediate (*intermédiaire*) school; the former is entirely for elementary education similar to that of the communal schools; in the latter the instruction is of a more advanced character, and makes the school a sort of preparatory institution to the colleges and Lycées. In the intermediate school the following is the programme of instruction:—French and German are taught with great care and success, so that the pupils when they leave school are able to write both languages, if not with elegance, at any rate with ease and correctness; arithmetic and geometry, with a course of plotting and levelling; physical geography; history, principally that of France; and religious instruction. To complete this instruction there is a course of drawing both linear and of ornament; and besides a special school for drawing is attached to the institu-

tion for students who intend to pursue industrial drawing and architecture as professions. The duration of the course of study at the intermediate school is four years; the pupils enter at the age of ten or twelve years, and are all day-scholars. The method of instruction is the same as that adopted at the mutual schools (*écoles mutuelles*); the more advanced and intelligent pupils take it in turn to act as monitors or pupil-teachers of the lower classes. Every year there is an examination and a distribution of prizes, and besides that a register is kept by means of marks of the progress and conduct of each pupil. Very often the number in attendance has reached 60 or 70; now it is about 40.

The pupils are drawn from the families of the heads of the different branches of the factory and the upper officers and clerks. At the end of every year examinations are held in all the primary schools of Wesserling and its immediate neighbourhood, as the result of which the most successful candidates are admitted to the intermediate school. For a long time the instruction given at the intermediate school was entirely gratuitous, but in consequence of the numerous applications for admission a small monthly fee of one franc is now charged. Rent (600 francs), material, supervision, cleaning, and lighting all included, the institution costs the partners about 6,000 francs annually. The salary of the professor is 3,000 francs.

Clientèle and finances of the intermediate school.

One of the greatest difficulties the proprietors have to encounter is the placing of the pupils when they leave school, although they have hitherto always succeeded in finding situations for them. As there are many branches in the establishment many clerks are required, and it is in that capacity that the majority of the pupils of the school enter the business. The whole staff of the works is recruited from the intermediate school, there is no stranger on the establishment. Many of the young men on leaving school go into the works as apprentices—mechanics, joiners, and carpenters; the term of apprenticeship is three years, and afterwards they make a tour of the different manufacturing districts of France for a year, at the expiration of which they can, if there is room for them, enter at Wesserling as workmen or foremen. Some find employment in machine factories, and others in the railway works, where they obtain good positions.

Difficulty in obtaining employment for old pupils.

The pupils of the intermediate school attend the special school of drawing three times a week; when they have left the school they can if they please attend the drawing course.

Special school for drawing.

Even those who have entered the workshops, especially in the engraving shop, are sent by permission of the chief of the shop to the drawing school to keep up their studies. In the

Wesserling establishment many engravers and designers are employed in the manufacture of chintzes, and these are all taken from the school. The pupils learn drawing there completely, especially the drawing and colouring of flowers. After having acquired the elements they enter with the composers (*compositeurs*) as finishers (*finisseurs*), in order that they may attain the degree of perfection which is wanting. All the finishers, and many of the designers, at the Wesserling works have been educated entirely at the schools on the spot, and several of them end by becoming composers. In order to refine their taste the designers pass every year two or three months at Paris.

Risk of France being surpassed by other countries in design.

In reply to the question, whether there is any risk in France being surpassed by other countries in industrial design, M. Gros replied, that the English are still obliged to come to Paris for their designs; there are many designers in France who do nothing but work for English manufacturers.

Night classes.

Formerly night classes for workmen were held at Wesserling itself, but have now been established in the surrounding villages. This arrangement was preferred by the working men themselves, that they might be enabled to reach home at an earlier hour. These night classes are well attended and are gratuitous; the instruction is given by the national schoolmasters, who are paid by the communes.

Opinion of M. Gros on the best way of developing professional instruction.

M. Gros being asked his opinion on the best means of developing professional instruction in France, thinks that in all centres of industry the manufacturers should associate themselves and establish schools similar to those at Wesserling, so that they may be able to recruit their staff from them. The success of such institutions must depend upon the facility with which appointments can be found for the pupils who leave them with a good character. It is plain that the Government cannot find employment for the pupils of these schools, but they can render most efficacious assistance by means of grants in aid and a regular system of inspection. The visit of the inspector would alone be a great encouragement. A programme of instruction bearing Government authority would also be well received.

Evidence of M. Kern, Minister at Paris of the Swiss Confederation, formerly President of the Council of the Federal Polytechnic School at Zürich.

The evidence of M. Kern consists entirely of an account of the Zürich Polytechnic, of which full details will be found in the third and concluding volume of this work, in the report

of the Sub-commission on the technical schools of Germany and Switzerland.

Evidence of M. Gouin, Civil Engineer, Paris.

In the provincial towns and in places distant from the populous centres, workmen must be regularly trained in their trades; they must be made accustomed to the best methods and processes of labour, and there, consequently, masters are compelled to keep apprentices. But in Paris there are many locksmiths who manufacture very careful work and who prepare workmen for the mechanical trade; there is no necessity for the masters to train them themselves. Besides, in Paris, apprentices would with difficulty find work. On these grounds, in the machine works in Paris there are no apprentices; they are trained at the locksmiths, and since these execute a great variety of work, sometimes of extraordinary delicacy, they have with them young men capable of executing any kind of work from the finest to the coarsest.

Not now so great a number of apprentices as formerly.

At M. Gouin's works they have a great number of the pupils of the Schools of Arts and Trades at Châlons, Angers, and Aix, and are well satisfied with their good conduct and willingness; they are not often very skilful, but they possess acquirements which soon enable them to become very fair workmen. After being a certain time in the works some of them turn out good designers and foremen. Nothing is more difficult to form than a machine designer and mechanical engineer; a hundred engineers for making railways can be found, before one who can make a good machine is discovered. To become a good mechanical engineer great patience is required; five or six years must be passed in a drawing office and a year or two in making tracings, so as to know a machine as a whole as well as its details, and not to be obliged to have recourse to calculation or drawings to know how to trace a piece which has to be made. Just as an artist is not compelled to measure every time the proportion of the head to the body to make a correct study of the figure, but has it all in his eye, so a machine designer ought to have in his head all the relations of the different parts of a machine. This knowledge is only acquired after a prolonged examination of excellent models. Naturally we do not find in the pupils of the Polytechnic School and of the Central School the necessary patience and attention to the minutest details. These gentlemen wish to advance more rapidly, whilst the pupils of Châlons and of Angers are more patient, and have no ambition to obtain a position all at once. Consequently they remain in the drawing offices and in the

Pupils of the Schools of Arts and Trades.

workshops long enough to be able to understand thoroughly the construction of machines and to become skilful designers, to whom a piece of work may be intrusted with security.

Use of machine tools.

At Châlons the pupils have only a general and vague knowledge of mechanics, they must, therefore, perfect themselves, and it is good for them to remain in the workshops three or four years before entering the drawing school. One point entirely escapes them at Châlons; they have scarcely any machine tools there, and those which they have are not of the most modern description. The pupils make very good forgers and fitters, but the use of improved tools is quite unknown to them. Every day machine work is employed more and more in manufacture, and it is therefore very important to know how the machines act and are employed. In this respect the pupils of Châlons are behind, and some time elapses before they can recover the lost ground.

Apprenticeship not of so great importance as formerly.

On all these accounts, apprenticeship is not of the same importance as it was formerly, and it is for the same reasons, independently of those given before, that there are now not so many apprentices as there used to be. Besides, everywhere it is now attempted to make the workman a specialist, and it is impossible in a workshop where this is done but that the apprentice should become a specialist also. At the Council of the Prud'hommes, parents complain every day that their children do constantly the same thing from one year's end to the other, and that thus they never get to know the secrets of their trades. The council insist that the masters should make their apprentices learn all the works which they execute themselves, but they can go no further. Besides, by the side of a workman who continually makes the same thing, it is very difficult that an apprentice should pass through all the stages of his trade. Apprenticeship is always necessary and remains the sole means of initiating a lad into the mysteries of his trade, but now-a-days what is required of an apprentice is rather regularity of attendance and conduct, and that he shall conform to the wishes of his master; this is not always very pleasant for an apprentice, but is not the less indispensable in the present condition of the manufacture of a great many articles.

The law of 1851 and action of the Council of Prud'hommes.

The law of 1851 on the apprentice contract stipulates that an apprentice shall have two hours a day for completing his education; this arrangement ought to be mentioned in the indentures, but it is seldom done. In the Council of Prud'hommes it has often been asked that greater authority should be given to the indentures. For the most part there is no written contract; it is merely a verbal agreement, which on one side or the other it is convenient to forget. It has

often been asked by the Council of Prud'hommes, that instead of leaving the depositing of the contract with the secretary of the council optional it should be made compulsory on the contracting parties, and there is no doubt that such a measure would have an excellent effect. The parents, often very ignorant, who enter into these contracts on behalf of their children, do not understand the importance of the engagements which they make, and are always tempted to release themselves from them under the most frivolous pretences. They believe that having made only a verbal agreement there is nothing binding on them. The Council of Prud'hommes are compelled to have recourse to witnesses to find out the truth, an inquiry which is always very difficult. It is necessary, therefore, that to deposit the written agreement with the secretary of the council, instead of being optional as it now is, should be made compulsory by law; it would be merely a simple deposit, without the council being called on to give their advice on the terms of the contract; they would only take notice of it in case of dispute. If the deposit were compulsory, the contracting parties would look on it in a more serious light, and would not break the agreement so easily.

There are many causes why both parties often wish the contract of apprenticeship to be terminated. On the part of the masters there is a tendency to make servants and errand-boys of their apprentices rather than teach them their trade, and the Council of the Prud'hommes has often been called on to arbitrate in a dispute arising out of this cause. In this case the apprentice is placed under the supervision of a member of the council, who makes periodical visits to the shop where he is employed, to acquire ocular demonstration of his progress. Again, a boy who has been apprenticed for three or four years, of which he has completed two, if he is able and intelligent, will know that as a journeyman he could get 2 francs a day, while as an apprentice he only gets 20 sous. Immediately he has but one idea, to become a journeyman. He disobeys his master in order to be discharged; but, if that does not succeed, he runs away, and takes work in another workshop, thus compelling his master to look for him. And when the master has found him, he goes to the father and makes a complaint; but the latter takes the part of his son, and accuses the master of ill-treating him, and so on. Every day the Prud'hommes have before them cases of this description, and for this reason are anxious for the law to fix clearly the limits of responsibility, both of the masters and the parents. Moreover, the council can only be severe with the masters; when the boy and his parents break their engagement, and the master having had the trouble of teach-

Causes for premature dissolution of the indentures, with proposed remedy.

Action of the
charitable
societies for
the support of
apprentices.

Watch and
clock-making
school.

Increased em-
ployment of
machine tools.

ing the boy loses the value of his labour just as he is capable of earning money, there is no remedy.

M. Gouin believes that the action of the apprentice societies is productive of great good, as there are very rarely instances of disputes about the contracts of apprenticeship in which they have intervened. He instances as an example the establishment of St. Nicolas, which has already been described at p. 27 of this volume.

M. Gouin recommends the establishment of a school of watch and clock making (*école réglementaire pour l'horlogerie de précision*). In general good watches are not made in France, and it is the exception to find a skilful workman; but, with a special school, he is sure that the horological manufactures of France could compete with those of Switzerland. He further recommends the formation of a school of naval architecture (*école de constructions maritimes*) in one of the ports of France, which should be for shipbuilders what the school at St. Etienne is for miners. He conceives that the pupils could attend school during a part of the day or the year, and during the other work as apprentices in the ship-building yards or dockyards of the arsenal. Unfortunately, naval construction is not far advanced in France, but such as it is, it is very difficult to find for it a sufficient number of skilled draughtsmen.

On the whole, M. Gouin is of opinion that the common workman is fast disappearing, and it is now endeavoured to make artizans more intelligent and more highly educated rather than to have *workmen* in the common acceptation of the word. Mechanics, skilled in the use of hand tools were formerly necessary to the trade; but now that there has been such an advance in machine tools, skilled smiths and fitters are no longer necessary; nowadays it is much more easy and expeditious to forge large pieces under the steam hammer. In the same way we have now planing and slotting machines for fitting, and the workman has nothing to do but to bring the pieces together and to finish the whole.

*Evidence of Madame Pelleport, Directress of the Upper
Municipal School, Passage St. Pierre, Paris.*

Account of the
school.

This boarding school contains 48 pupils belonging to families of the small tradesman and workman class. They are admitted from 13 to 18 years of age. There are 22 scholarships, 11 being communal and 11 municipal; the former are obtained by a severe competition among the girls leaving the primary schools, the latter, on the contrary, are given by nomination. The other pupils, 26 in number, are

paying, the terms being 600 francs a year. All the pupils receive the same instruction in grammar, geography, a little literature, and an insight into ancient, Roman, and general history; under this head they cannot go very far, as the course of study extends only over three years. Singing, English, drawing, and bookkeeping are also taught; music is optional, and paid for separately. The instruction in drawing consists of linear and head drawing, but drawing of ornament applied to industry is not taught.

It would be difficult to say how this school can be called technical or professional. Though sewing is taught, it is not in order to make the pupils sempstresses by trade, but as a branch of education necessary to every woman. A great many of the pupils become mistresses at the municipal schools, and a few at private schools. It is the wish of Madame Pelleport to put her pupils in the way of getting their own living without becoming either sempstresses or governesses. The pupils are accustomed to domestic work, as they have to clean the dormitories, class rooms, &c., of the school.

Future career
of the pupils.

The school has its buildings rent free from the city of Paris. The household expenses and payment for seats in church amount to about 1,700 francs per month: 7,400 francs a year go in salaries to the teachers, and 900 francs in wages to the servants.

Finances.

Evidence of M. Houel, Manager of the Derosne Establishment, of Cail, and Co.

M. Houel says:—

“I shall commence with the question of the instruction of apprentices. I believe that in the provincial centres of industry, as Lille or Mulhouse, more favourable conditions could be created than at Paris. Thus at Fives, at the establishment of Parent, Schaken, Caillet, and Co., of which I am the fourth partner, we have begun to give special instruction to our apprentices, and doing this in the interest of the children and in that of the parents, we believe that it is also in the interest of our establishment.”

Importance of
an instruction
for apprentices.

“In fact, the provincial workshops are under quite different conditions from those in the capital. At Paris as many workmen as are wanted can be found. In the provinces, on the contrary, it is often difficult; we are compelled to create a staff of employés and operatives, who we wish may become attached to our establishment; we must attract both children and parents by making it easy for them to find dwelling places and schools close to their work. This is what we wish to effect, and in which we have already succeeded in many centres.”

Difficulty of
obtaining
work-people in
the provinces.

A school for apprentices attached to the workshop.

"Our establishment, founded now about three years, employs 1,500 to 1,800 men; we have 60 apprentices, and we are thinking of raising the number to 300 or 400. Our apprentices have one hour of intellectual labour, but we believe that to learn properly they should have four or five hours daily; we would willingly allow it to them, and we should probably arrive at an instruction which would qualify some of them to become candidates for the Schools of Arts and Trades, and that under conditions very favourable to their practical knowledge."

Inconveniences of evening classes.

"It has sometimes been spoken of to make workmen study at night; I believe that to be almost impossible. A man who has been at work all day cannot study, unless indeed he has an exceptional constitution; a man who has the care of a family, who works at piece work, and gives all his energy to it, has need of the evening for rest. According to my idea the working man cannot gain much by studying at night; he may go to his class one evening but he will not go again. It is the apprentice with whom we should occupy ourselves, because he is of an age to divide his time between manual and intellectual labour."

Educated workmen much required.

"Now a-days it is necessary to have educated workmen. France sends as many artizans abroad as England. When we have a workman to send to Italy or Spain we enquire what he knows, and we find that in general he is a thoroughly practical man who knows his work perfectly; but if we ask him to make a calculation, or to keep an account of petty cash, we directly discover his incapacity. On the other hand if we take a pupil from the schools, we find him less practical than the working man, less able on the whole to meet the requirements of the situation. In fact we are compelled to send in preference a man who is not educated, but who knows how to work. What is wanting then is a man capable of working and yet instructed, and it is therefore of the greatest importance to trade to promote the instruction of apprentices, by attaching a school to the workshop as we have done at Fives."

Doubling the number of apprentices in order that they may give up half their time to school.

"I confess I have here given utterance to an idea which deserves to be considered practically; it would be well to examine in detail what are the cases where a child, giving six hours of work a day to his master, can be replaced by another child while the first one goes to school. There are circumstances under which there would be some difficulty in making apprentices thus alternately go to work, but I think that in most cases it would be possible. Thus in a workshop like ours I do not see why we could not employ 200 apprentices as well as 30 or 40; in fact the majority merely work

as assistants to the workmen, and could easily be replaced in this work by others. It is only when a child has himself commenced a piece of work that it cannot be finished by another. But I think that this difficulty can be overcome by having twice as many children as are wanted for their work and by giving each of them only half of what he can do in twelve hours."

"I think then that it would be an excellent plan to organize in one large industrial establishment an intellectual training sufficiently advanced to allow of practical and scientific acquirements being placed on the same footing, and to enable parents who are sufficiently enlightened to send their children to the Schools of Arts and Trades. For my own part I know of no better instruction to make able workmen than that which is given at those schools, because there the studies run parallel to one another. We are indebted to them for the fact that in mechanical construction we are the equals of any other nation in Europe. We ourselves employ a great number of the pupils of these schools. Of the 300 who pass out of them every year, there are some who are more or less not so well prepared; there are some of whom we can make nothing but workmen, sometimes even only moderately good workmen; but there are others who are very intelligent, and have profited to the utmost by the intellectual and scientific training they have received. Such as have not been able to learn mathematics, but possess practical capabilities become excellent foremen; we meet with men among them who have a great liking for practical acquirements, because in general they are good draughtsmen. A young man who can work well and is skilful with his hands is also a good draughtsman, and that is one of the first qualifications of a good foreman.

"We are all the more in a position to feel the want of workmen who have a knowledge of drawing, in that our method of manufacture (which we owe to the Schools of Arts and Trades) is quite different to that adopted in England, and to that which for a long time was in use in France. I am the manager of two works, those of Messrs. Cail & Co. and those of Messrs. Parent, Schaken, Caillet & Co., which employ together about 5,000 hands; that number might be easily increased to 50,000, if we had a sufficiency of draughtsmen. Our method consists in giving full details of every work piece by piece, so that the workman has only to execute the piece according to the drawings which are confided to him. With a large staff of draughtsmen we produce works at these establishments to the amount of over thirty millions of francs, which would be an impossibility without our means and process of manufacture."

Influence of the Schools of Arts and Trades on the mechanical industry of the country.

Value of draughtsmen.

Inconvenience attending apprenticeship in large workshops.

“It must be acknowledged that in large workshops apprentices are not in such favourable circumstances for learning their trades as in smaller ones: establishments with large capital undertake considerable contracts, and are therefore compelled to make many things of the same description. In a small workshop, on the contrary, where they execute a variety of works, the same objects are not turned out in so large a number. We manufacture in our three establishments 150 locomotives, and we could make 200; there are therefore many parts which are repeated. If a young man executes well a piece of work which is intrusted to him, it may happen that he has given to him the same work for a year or more and he will be able to make a profit by it: in a pecuniary point of view it is at once the interest of his employers, of his parents, and of himself that he should continue for some time manufacturing the same thing.

Shortcomings of the instruction given at the Schools of Arts and Trades.

“In the Schools of Arts and Trades this method is not adopted; there the pupils are made to execute works which are gradually made more and more difficult, so that their acquirements may increase gradually. But this mode of instruction has also its inconveniences, for the result is that the pupils cannot produce their work rapidly. They ought to execute in these schools a greater quantity of work, and to have among the pupils a number of skilled mechanics to show them how to turn out their work quickly. We take every year fifteen pupils from the school at Châlons, and as they are much sought after we do our best to obtain the best. For two years they are employed in our workshops, and are then sent into the drawing office; at the end of four or five years they are of great service to us. But it is evident that if they were more conversant with manual labour when they leave school, they would not have to pass two years in the workshop; they could be spared that probation, and would be sooner in a position to occupy higher posts. Works of greater importance ought to be executed in the schools; and if by the side of the pupils there were a few picked workmen who knew how to turn out work well, they would serve as an example to the young men of the school, and those who possessed industry and ability would endeavour to emulate them in rapidity of execution and skill.”

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APPOINTED BY

Imperial Decree, 22nd June 1863.

ABSTRACT OF EVIDENCE TAKEN BEFORE THE
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Presented to both Houses of Parliament by Command of Her Majesty.



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